

BIOMETRICS OF THE BIRDS OF PARADISE (AVES: PARADISAEIDAE): WITH OBSERVATIONS ON VARIATION AND SEXUAL DIMORPHISM

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The Australasian bird of paradise family Paradisaeidae is presently considered to consist of 42 species. The family includes species groups and species exhibiting morphological, ecological, zoogeographical and behavioural characters of fundamental interest to many disciplines of science. Over recent years there has been an exponentially rapid increase in interest in bird of paradise biology and systematics at all taxonomic levels. Biometrical data presented here are by far the most comprehensive and directly comparative gathered for the Paradisaeidae at the family, generic, specific and subspecific levels. Mean values and ranges of measurements of each subspecies are given, and interspecific and intraspecific size variation and sexual dimorphism discussed. These data and others are used to assess the validity of bird of paradise subspecies discussed by recent authors. □ *Paradisaeidae, Birds of Paradise, systematics, sexual dimorphism, morphometrics.*

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The Australasian bird of paradise family Paradisaeidae is presently considered to consist of 42 species constituting 16 genera and involving a total of approximately 100 subspecies (Gilliard, 1969), to which a few have been added more recently. Birds of paradise include species groups and species exhibiting morphological, ecological, zoogeographical and behavioural characters of fundamental interest to many disciplines of science (Diamond, 1981, 1986; Beehler, 1989; Johnsgard, 1994). Thus there is a large literature about birds of paradise including at least nine major monographs, in addition to more general works and hundreds of scientific publications (Frith, 1979). Moreover, over recent years there has been an exponentially rapid increase in interest in their biology and systematics at all taxonomic levels (Bock, 1963; Gilliard, 1969; Diamond, 1972, 1986; Pruett-Jones & Pruett-Jones, 1988, 1990; Beehler, 1989; Sibley & Ahlquist, 1990; Clench, 1985, 1992; Cracraft, 1992; Christidis & Schodde, 1991, 1992; Frith, 1992; Frith & Cooper, 1996; Frith & Frith, 1990, 1992, 1993a,b, 1994, 1995, 1996a,b, in press).

Birds of paradise attract considerable attention because of the elaborate to bizarre plumage of adult males that are related to the polygynous mating system of most sexually dimorphic (and some sexually monomorphic) species and promiscuity in males. For details of their general appearance and biology see Gilliard (1969), Cooper & Forshaw (1977), Beehler et al. (1986) and Coates (1990). Promiscuous adult male birds of

paradise show remarkable interspecific diversity of highly colourful and ornate plumages, which they use in highly ritualized and complex solitary or communal (lek or exploded lek) courtship displays at traditional sites, perches or courts (Diamond, 1986; Beehler, 1989). A remarkable feature of these birds, and stressing the close genetic relationships between them, is the marked diversity of intra- and inter-generic hybrids (Stresemann, 1923, 1930, 1934; Mayr, 1941; Gilliard, 1969; Fuller, 1979, 1995). The vast majority of known hybrid specimens are in full or subadult male plumage (Fuller, 1979), but recently two hybrids have been described in female plumage (Frith & Frith, 1996a, b). One of the latter, a unique hybrid between *Lophorina superba* and *Parotia carolae*, was until recently erroneously known as *Lophorina superba pseudoparotia*.

Birds of paradise are so conspicuously significant to sexual selection theory that they were described and discussed at length by Wallace (1869) and Darwin (1871), and innumerable authors since (see references in Frith, 1979; Diamond, 1981; Beehler, 1989; Johnsgard, 1994). In attempting to understand the evolutionary origins and functions of polygynous mating systems and the role and influence of sexual selection within them, it is important to know the physical attributes of the species concerned. In particular one must be aware of fundamental sexual dimorphism (in characters other than secondary sexual ones such as adult male plumage). Sexual dimor-

phism in size is particularly significant as it is usually conspicuous in polygynous vertebrates in which males are typically larger than females, but is reversed in polyandrous species in which females may be larger than their multiple mates (Darwin 1871). Notwithstanding the enormous literature on the birds of paradise, no study has been devoted to comprehensively demonstrating and reviewing variation in size between the species, sexes and their subspecies. No publication presents more than the vaguest of measurements for only the smallest of samples. Most of them in fact fail to indicate any sample sizes.

The monograph by Gilliard (1969) is the standard modern text for comparative bird of paradise measurements at the species level, but only size ranges for some basic characters are provided therein. No sample sizes are given and few, if any, are presented for the vast majority of subspecies. Cooper & Forshaw (1977) presented measurements for 'five or more specimens' of nominate subspecies of each species only. The only subgroups for which reasonable data have been presented in recent years are those of the Glossy-mantled Manucode *Manucodia ater* (Gilliard, 1956) and of all *Paradisaea* species (LeCroy, 1981). As the latter two studies were based predominantly upon specimens in the American Museum of Natural History, they understandably present relatively small sample sizes compared to those presented here.

Several authors have discussed the validity of various bird of paradise subspecies with respect to plumage morphology and relative sizes (Gilliard, 1969; Schodde & McKean, 1972, 1973; Diamond, 1972; Coates, 1990; Cracraft, 1992). Cracraft dramatically revised the systematics of the family by applying the 'phylogenetic species concept' (Cracraft, 1992 and references therein). This in large part involved Cracraft reviewing the subspecies acknowledged by Gilliard (1969) and elevating the vast majority of them to 'species' level. Cracraft (1992) considered 25 of the bird of paradise subspecies recognised by Gilliard (1969) to be not 'diagnosably distinct', and therefore reduced them to synonymy in accord with his phylogenetic species concept. He recognised one 'species' named since Gilliard's monograph (*Epimachus fastuosus ultimus*, Diamond, 1969) and named two new 'species' himself (*Manucodia [keraudrenii] aruensis* and *M. [keraudrenii] diamondi*).

All of the above authors expressed the view that a number of subspecies (valid or invalid 'species' of Cracraft, 1992) were possibly or probably in-

valid but that more comparative material, or other types of evidence, were required for firm conclusions. While larger series of skins of some taxa were available to us in a single collection, or were gathered together at a single institution, for comparative review of plumage morphology this was not possible for the majority of the subspecies. Thus, we seek here to primarily use the considerable biometrical data we accumulated to assess the validity of bird of paradise subspecies presented by Gilliard (1969), Diamond (1972) and subsequent authors (Cracraft, 1992; and references therein). The value of observed differences in average size between populations has limitations given that size is a continuously varying character. It is more useful to plot individual specimens over the geographical range of a taxon in order to perceive any clinal variation in size, but this approach is most rarely applied and is well beyond the scope of the present study. It is clear, however, that biometric data available prior to this study are grossly inadequate and have led to numerous erroneous statements concerning the sizes of some characters of some taxa and others concerning supposed sexual dimorphism in size (see below).

The present re-evaluation of bird of paradise taxa in the light of significant biometrical data sets is timely both in terms of complimenting and assessing Cracraft's (1992) revision of plumage morphology. Moreover, it provides basic evidence supporting the subspecific taxonomy to be followed in a forthcoming monograph of the biology of the group (Frith & Beehler, in prep.). This is desirable as it will not be possible to present and discuss the significant supporting biometrical data in that forthcoming work. Accepted genera and their sequence are those of Beehler & Finch (1985), with the addition of those taxa extralimital to New Guinea and therefore not dealt with in that publication. As taxa accepted by Gilliard (1969) form the basis for contemporary studies, we follow here his systematics and scientific names at the species and subspecies level (more recently described taxa accepted). The latter are presented in chronological order of description.

Data sets herein provide a significant resource to students of the systematics and biology of the group and also to those interested in sexual selection and size dimorphism in an avian group (including both polygynous and monogamous mating systems) or avian biometrics in general. Beyond that, a data set of this magnitude for an entire avian family will prove of value to biology

students with an interest in more general studies of systematics, speciation, sexual and other dimorphism.

METHODS

During a recent world tour of larger collections of bird of paradise skins the authors examined all sexed specimens from a recorded locality. Museum specimens were examined at or from (on loan to us) the following institutions: Queensland Museum, Brisbane; Australian National Wildlife Collection, CSIRO, Canberra; Australian Museum, Sydney; Museum of Victoria, Melbourne; South Australian Museum, Adelaide; Western Australian Museum, Perth; American Museum of Natural History, New York; The Natural History Museum, London; Museum of Vertebrate Zoology, University of California, Berkeley; The Field Museum, Chicago; Museum of Comparative Zoology, Cambridge; Bernice Pauahi Bishop Museum, Honolulu; Royal Ontario Museum, Toronto; Academy of Natural Sciences, Philadelphia; The Carnegie Museum of Natural History, Pittsburgh; Peabody Museum, Yale University, New Haven; Delaware Museum of Natural History, Wilmington; National Museums & Galleries, Liverpool; Nationaal Natuurhistorisch Museum, Leiden; Swedish Museum of Natural History, Stockholm; Zoologisk Museum Københavns Universitet, København; Museum national D'Histoire Naturelle, Paris; Staatliches Museum für Tierkunde, Dresden; Zoologische Staatssammlung, München; Zoologische Museum Berlin; Museum Alexander Koenig, Staatliches Museum für Naturkunde, Stuttgart; Forschungsinstitut und Naturmuseum Senckenberg, Frankfurt; Zoologisches Institut und Zoologisches Museum, Hamburg; Museum Zoologicum Bogoriense, Bogor; National Museum and Art Gallery of Papua New Guinea, Port Moresby.

A sample of at least 25 individuals for each sex and age class for each subspecies accepted by Gilliard (1969) was measured where possible. Measurements were all taken in the same standard way with the same instruments by CBF. 'Wing length' is the flattened and straightened chord and was measured with a stopped steel decimal rule. 'Tail centrals' is the maximum length of the longest of the central pair of rectrices from the point of feather entry into the skin to its tip, and 'tail length' the same but to the tip of the longest tail feather other than the central pair. Tail measurements were made with an unstopped

small steel decimal rule. When the central and outer tail rectrices are the same length, or nearly so (<3mm difference), only the longer measurement (usually tail length) is presented as 'tail length', unless there is intrageneric variation, and then both 'tail centrals' and 'tail length' are given.

Other measurements were taken with steel electronic digital vernier calipers to the nearest whole decimal point and checked and zeroed daily. 'Bill length' is from the union of the bill with the fore skull to the tip of the upper mandible, and 'bill width' from the anterior nostril edge. 'Total head length' is the maximum distance from the back of the skull to the tip of the upper mandible. It was measured only from specimens retaining sufficient of the rear skull to permit it. It is possible some specimens that appeared complete in this respect may not in fact have been so and therefore the total head length figures presented must be considered minimum ones. 'Tarsal length' is from the intertarsal joint to the lower edge of the last undivided scute (scale) before the toes diverge. Where possible, all of these measurements were taken from a total of 5677 museum specimens. Weights, recorded upon death of the bird, were noted from the labels of measured specimens and also from those of an additional 408 skins that we did not measure (total specimens being 6085). We also include additional weights ($n = 298$) obtained from living birds by ourselves or others trapping and releasing them.

In certain bird of paradise groups species have peculiar or unique feathers that provided additional measurements useful for an examination of possible intraspecific variation. In *Manucodia keraudrenii* we measured the length of 'ear tufts' of feathers from their posterior base to the tip of the longest with a small unstopped steel rule. Likewise we measured the structurally similar tuft of feathers at the base of the 'flag'-tipped occipital plumes in adult male *Parotia* species and the analogous single elongate 'ear' feather found in female-plumaged *Pteridophora alberti*. The maximum length of the longest occipital plumes of both *Parotia* species and *Pt. alberti* and the crest length of *Cnemophilus macgregori* were likewise measured. The maximum length of the modified upper wing coverts or 'standards' of *Semioptera wallacei* are also presented. The length of pectoral flank plumes (of *Seleucidis*, *Paradisaea*, etc.) are rather more subjective and give only an indication of relative flank plume size. This involved laying the male specimen on its back with the end of a steel rule at the tip of the tail and subjectively assessing the average length of

the bulk of plumes (excluding odd finer and longer feather tips) projecting beyond the tail tip.

In Tables 1-42 we present mean values, standard deviations, ranges and sample sizes for each measured character of each sex and age class of all subspecies, and for each species as a whole. Data for markedly sexual dimorphic species in which males may have an adult, subadult (trace to almost complete adult male plumage intruding into female plumage) and immature male (female-type) plumage are presented separately for each male age group. Data for females of those species whose plumage is generally similar at all ages, are presented collectively. The latter are referred to as adult females despite the fact that samples will inevitably include some individuals less than adult given the great similarity in plumage, but data for individuals smaller than adult size (i.e., juveniles to immatures) are excluded. Data for basically monomorphic species, in which adult males and adult females are generally similar but have a discernibly different immature plumage, are given separately for each immature sex. A single exception is *Loboparadisea sericea* for which we combine data for immatures and subadults of both sexes as the very few specimens of birds in the latter plumage did not warrant their separation.

In the species accounts we cite the original description and type locality of each taxon after the species name, if monotypic, or after each subspecies name. Early synonyms are not presented. We discuss the biometric data for the species as a whole, and for subspecies where it is necessary to point out differences in size and proportions between them. We do not here fully describe plumages of nominates or describe and discuss distributions of the various taxa unless pertinent as these are widely available (Gilliard, 1969; Cooper & Forshaw, 1977; Cracraft, 1992) and will be presented anew in a forthcoming monograph (Frith & Bechler, in prep.).

Because bird of paradise measurements presented in Gilliard (1969) and Cooper & Forshaw (1977) are those referred to in the contemporary ornithological literature we make specific observations upon them as and when required. Our relatively large sample sizes enable us to critically evaluate previously published assessments of several size-related characters and have in some cases found them misleading or erroneous. Gilliard (1969) and Cooper & Forshaw (1977) present 'culmen length' as opposed to bill length. Culmen length is that of the exposed culmen and is taken from the point where forehead feathers

no longer cover the culmen to the bill tip. This is not a measurement of a discrete structure and is far more subjective (and variable) than 'bill length' (from anterior margin of the skull to the bill tip). Thus the culmen measurements of Gilliard (1969) and Cooper & Forshaw (1977) are consistently shorter than ours and we will not allude to them again unless to note their inherently misleading nature (see *Lophorina superba* below).

The following abbreviations are used below: A = adult; SA = subadult; I = immature; MWL = mean wing length; MTL = mean tail length; MTCL = mean tail central length; MLL = mean tarsal length; THL = total head length; MBL = mean bill length; MBW = mean bill width; MW = mean weight; METL = mean ear tuft length; MOPL = mean occipital plume length; MFPL = mean flank plume length.

RESULTS AND DISCUSSION

PARADISAEIDAE CNEMOPHILINAE

Cnemophilus macgregorii Crested Bird of Paradise (Table 1).

A ♀ similarly sized to or slightly smaller than A ♂, and of similar proportions, MWL and MW by 4 & 7% respectively. MTL similar in A ♀, A ♂ and I ♂. Thus, ♂ do not acquire a progressively shorter tail with age (as in *C. loriae*). MTL as a proportion of MWL similar in both sexes, 80 & 82% respectively. MLL and MBL of A ♀ 3 & 9% shorter than in A ♂ respectively, but similar in proportion to MWL in both sexes. Crest lengths of A ♂ and SA ♂ average 34 ± 4 mm (n = 51) & 32 ± 3 mm (n = 9) respectively, but shorter in (I) ♂, and A ♀, averaging 19 ± 6 mm (n = 22) & 17 ± 4 mm (n = 25) respectively.

1) *C. m. macgregorii* De Vis, 1890. Annual Report of British New Guinea 1888-89: 62. Mt Knutsford (erroneously Mt Musgrave in Gilliard 1969), Owen Stanley Mts. Wing lengths of 116-121 mm for A ♂ and 115-120 mm for A ♀ presented by Cooper & Forshaw (1977) are inexplicably long given that our measurements are of maximised wing lengths.

2) *C. m. sanguineus* Iredale, 1948. Australian Zoologist 11: 162. Kumdi, Mt Hagen District. Like nominate but generally more red, being orange-red about head, less red on back to orange rump, underparts with less copper-red suffusion. MWL slightly larger, but MTL slightly shorter, than nominate.

3) *C. m. kuborensis* Mayr & Gilliard, 1954. Bulletin of the American Museum of Natural History 103: 361. Mt Orata, Kubor Mts. Upperparts of A♂ very like *sanguineus* but slightly paler, less saturated with red and underparts more black, less suffused with red-brown. Characters supposedly distinguishing this subspecies from *sanguineus* have been doubted (Diamond, 1972; Bechler in Coates, 1990; Cracraft, 1992); we found a Mt Giluwe specimen of *C. m. sanguineus* showing these characters. MWL and MTL of *kuborensis* slightly shorter than *sanguineus*, but samples too small for meaningful comparisons. Morphology does suggest, however, that *kuborensis* is invalid and should be synonomised with *sanguineus*.

4) *C. m.* subspecies. Gilliard (1969) was brought an A♂ specimen in the field said to come from the Kraetke Mts, where the species is unrecorded, which was paler than Wahgi Highlands birds. He felt that if the specimen was not faded it might represent an unknown subspecies. An A♂ specimen in Zoologische Museum, Hamburg from Malingdam, near Mt Goliath, Irian Jaya, we examined also fits this description but could possibly be the result of immersion in alcohol. Its wing, tail, tarsal and bill lengths measure 115, 86, 43.6 & 29.4mm respectively; bill width 6.3mm and weight 90g. These measurements are within the ranges of other subspecies.

Cnemophilus loriae Loria's Bird of Paradise (Table 2)

A♀ similar to or only fractionally smaller than A♂, and of similar proportions, MWL similar but MW 5% lighter. MTL of A♀ and I♂ slightly longer (3 & 5% respectively) than A♂. Thus, ♂ acquire a progressively shorter tail with age. MTL 71 and 74% of MWL in A♂ and A♀ respectively, so proportionately longer in A♀. MLL and MBL of A♀ negligibly (2%) shorter than in A♂, but similar in proportion to MWL in both sexes.

1) *Cnemophilus l. loriae* Salvadori, 1894. Annals Museo Civico Genova, ser 2, 14: 151. Moroka, Owen Stanley Mts. Iridescence on tertials of A♂ blue.

2) *Cnemophilus l. amethystina* Stresemann, 1934. Ornithologische Monatsberichte 42: 144. Schraderberg, Sepik Mts. Iridescent upper surfaces of tertials of A♂ deep violet-purple, but A♀ as other subspecies. Similar in size to nominate, but MWL and MTL slightly longer than in other subspecies.

3) *Cnemophilus l. inexpectata* Junge, 1939. Nova Guinea, new series 3: 77. Bijenkorf, Oranje Mts. Iridescence of tertials of A♂ more green than the blue of *loriae* or the violet-purple of *amethystina* but A♀ as other subspecies. Similar in size to nominate, with MTL only slightly shorter than nominate and (more so) *amethystina*.

Loboparadisea sericea Yellow-breasted Bird of Paradise (Table 3)

A♀ (uniquely in the Paradisaeidae) slightly larger than, but similarly proportioned to, A♂, MWL and MW (sample small) by 2 & 14% respectively. MTL of A♀ and I♂ slightly longer (4 & 7% respectively) than A♂. Thus, ♂ acquire a progressively slightly shorter tail with age. MTL 59 & 61% of MWL in A♂ and A♀ respectively. MLL similar in length and in proportion to MWL in both sexes. MBL of A♀ 5% longer than in A♂, but similar in proportion to MWL in both sexes.

1) *L. s. sericea* Rothschild, 1896. Bulletin of the British Ornithologists' Club 6: 16. 'Dutch New Guinea'. Restricted to the Weyland Mts (Mayr, 1941). ♀ said to be larger than ♂ (age unspecified) in the Weyland Mts but not so on Mt Karimui (Diamond, 1972). Certainly ♀ from the Weyland Mts have longer wings and tails than those on Mt Karimui but Diamond's samples are too small (A♂ x 1; I♂ x 1, ♀ x 2) for meaningful comparisons.

2) *L. s. aurora* Mayr, 1930. Ornithologische Monatsberichte 38: 147. Dawong, Herzog Mts. Plumage of upperparts significantly brighter (paler), more brown-yellow, the crown far paler and more greenish and less brown, but underparts similar to *sericea*. Larger than nominate, MWL and MTL of A♂ by 3 & 7% respectively. While not discussing it, Cracraft (1992) appeared to reject Diamond's (1972) attribution of birds from the Mt Karimui area, Papua New Guinea to the nominate (where we have also included them) and considered them to be *L. s. aurora*. If, however, they are *aurora*, their measurements would be at the lower end of the size range for this subspecies.

PARADISAEINAE

Macgregoria pulchra Macgregor's Bird of Paradise (Table 4)

A♀ markedly smaller than, but similarly proportioned to, A♂, MWL, MTL and MW (sample small) by 11, 11 & 26% respectively. I♂ and SA♂

have not been collected or are difficult to differentiate and so it is unknown if MTL increases or decreases with age. MTL 76% of MWL in both sexes. MLL and MBL of A♀ 8 & 6% shorter than in A♂ respectively, but similar in proportion to MWL in both sexes.

This sexual size dimorphism is distinctly different from all three members of the subfamily Cnemophilinae and is greater than the majority of polygynous Paradisaeinae. Its extent is unusual in a monogamous bird of paradise (Rand, 1940; Beehler in Coates 1990).

1) *M. p. pulchra* De Vis, 1897. *Ibis* 1897: 251, pl. 7. Mt Scratchley, south-eastern New Guinea. Wing lengths of 188-193mm for A♀ (Cooper & Forshaw, 1977) are inexplicably large given our measurements are maximised wing lengths.

2) *M. p. carolinae* Junge, 1939. *Nova Guinea* (New Series) 3: 82. Oranje Mts. Proportionally different from nominate, MWL and MTL shorter by 5 & 6% and 17 & 16% and MLL longer by 5 & 4% in A♂ and A♀ respectively. Weights of *carolinae* heavier than *pulchra*, but samples too small for meaningful comparisons.

Lycocorax pyrrhopterus Paradise Crow (Table 5)

A♀ similar to or slightly smaller than A♂ in size, proportions and notably weight, MWL, MTL and MW by 3, 4 & 12% respectively. I♂ have not been collected or are difficult to differentiate and so it is unknown if MTL increases or decreases with age. MTL 73% of MWL in both sexes. MLL and MBL of A♀ 2 & 5% shorter than in A♂ respectively, but similar in proportion to MWL in both sexes.

1) *L. p. pyrrhopterus* (Bonaparte, 1851). *Conspectus Generum Avium* 1 (1850): 384. Gilolo I. Concealed bases of primaries with no white. MTL 75% of MWL in both sexes.

2) *L. p. morotensis* Schlegel, 1863. *Ibis* 1863: 119. 'Mortag'. Much like nominate but paler, slightly more brownish above but slightly darker below. Concealed bases of primaries extensively white. Significantly larger than the other two subspecies in all measured characters. MTL 71 & 69% of MWL in A♂ and A♀ respectively, and thus similar to *obiensis* but proportionally shorter than nominate. MWL and MTL of A♂ 15 & 9% and 7 & 8% longer than in A♂ *pyrrhopterus* and *obiensis* respectively; these figures slightly less (12 & 4%, 6 & 3%) for A♀.

3) *L. p. obiensis* Bernstein, 1864. *Journal für Ornithologie* 12: 410. Obi Is. Generally like nomi-

nate but distinct in being much darker overall, much more glossy blue-green, darker and more blue-black on crown and uppertail. Far more different from nominate than *morotensis* and possibly approaching species status (Cracraft, 1992). Concealed bases of primaries with trace of white only. Oddly Lambert (1994) incorrectly wrote of *obiensis* that birds have a whitish streak above and behind the eye. Larger than nominate in all measured characters. MTL 71% of MWL in both sexes and thus proportionately shorter than nominate.

Manucodia atra Glossy-mantled Manucode (Table 6)

A♀ similar to or slightly smaller than A♂ in size, proportions and notably weight, MWL, MTL and MW by 4, 6 & 13% respectively. I♂ and I♀ smaller than respective adults in MWL (6%) & MTL (7 & 5%), and lighter (sample small). Thus, tail length increases with age in both sexes. MTL 84 & 83% of MWL in A♂ and A♀ respectively. The tail/wing index for both sexes combined ranges from 84-89%, these figures similar to those given (82-88%) by Coates (1990). MTL longer than other *Manucodia* species, excluding *M. comrii*. MLL and MBL of A♀ 3 & 5% shorter than in A♂ respectively, but similar in proportion to MWL in both sexes.

Since a thorough study by Gilliard (1956), resulting in the acceptance of the three subspecies, only Cracraft (1992) has reviewed the species. In assessing plumage variation, from the phylogenetic species concept point of view, Cracraft considered there to be no diagnostic characters within *M. atra* populations. We agree with Gilliard, however, that it would be misleading to include all populations in a single taxon in the face of what in fact are quite gross plumage differences apparent at the extremes of the range of this species and the clear differences in size demonstrated here. We therefore follow Gilliard's treatment until genetic studies provide definitive answers to this complex problem. Our measurements of wing and tail for the species as a whole agree closely with those of Gilliard (1956); but his exposed culmen is not comparable with our bill length and his tarsal length range is larger than ours, indicating differing measuring techniques.

1) *M. a. atra* (Lesson, 1830). *Voyage of the Coquille, Zoology* 1: 638. Dorey, north-western New Guinea.

2) *M. a. alter* Rothschild & Hartert, 1903. Novitates Zoologicae 10: 84. Sudest I. Flanks and belly markedly more violet than *atra*. Notably larger than nominate, A♂ by 12 & 15% and A♀ 9 & 12% in MWL and MTL respectively. MLL, THL and MBL of A♂ exclusively larger than nominate and nearly so in A♀.

3) *M. a. subalter* Rothschild & Hartert, 1929. Bulletin of the British Ornithologists' Club 49: 110. Dobbo, Aru Is. Said to average much more purple and violet with oil-green rare on adults (Gilliard, 1969). On average larger than nominate, but smaller than *alter*. An analysis more thorough than is possible here is required in order to test the possibility that birds are clinal in size from larger ones in the extreme south-east of Papua New Guinea to smaller ones toward the extreme southeastern-most part of the range of the generally smaller nominate on the Gulf of Papua.

Manucodia chalybata Crinkle-collared Manucode (Table 7)

M. chalybata (Pennant, 1781). Specium Faunula Indica, in Forster's Indian Zoology 1781: 40 (based on Daubenton, Planches Enluminées, pl. 634). New Guinea, restricted to the Arfak Mts. Monotypic. A♀ similar to or slightly smaller than A♂ in size, proportions and weight, MWL, MTL and MW by 3, 4 & 3% respectively. I♂ and I♀ smaller than respective adults in MWL (2 & 4%) and MTL (6 & 4%), and lighter (sample small). Thus, tail length increases with age in both sexes. MTL 82 & 81% of MWL in A♂ and A♀ respectively. The adult tail/wing index for both sexes combined ranges from 81-84%, these figures within the range of those (78-86%) presented by Coates (1990). MLL and MBL of A♀ 2 & 5% shorter than in A♂ respectively, but similar in proportion to MWL in both sexes.

The tarsal lengths of 41-45mm for A♂ and of 39-46mm for A♀ of Cooper & Forshaw (1977) do not agree with our measurements. This species is difficult to differentiate from *M. jobiensis* in almost all external morphology as they are generally similar and overlap in most measurements, but the latter species does have a (5-6%) shorter tail proportionate to wing length.

Manucodia comrii Curl-crested Manucode (Table 8)

A♀ slightly smaller than A♂ and of similar proportions, MWL and MTL by 5 & 4% respectively. I♂ and I♀ smaller than respective adults,

but samples too small for meaningful comparisons, MTL 71% of MWL in both A♂ and A♀. The adult tail/wing index for both sexes combined ranges from 70-76%, MLL and MBL of A♀ 3 & 6% shorter than in A♂ respectively, but similar in proportion to MWL in both sexes.

Gilliard's (1969) A♂ tarsal length of 57 mm and Cooper & Forshaw's (1977) of 54-59 mm for both sexes are very long.

1) *M. c. comrii* Sclater, P.L. 1876. Proceedings of the Zoological Society of London 1876: 459. Huon Gulf in error for Fergusson I.

2) *M. c. trobriandi* Mayr, 1936. American Museum Novitates 869: 3. Kajileuna, Trobriand I. Plumage as nominate with MWL and MTL shorter by 7 & 9% and 6 & 7% in A♂ and A♀ respectively. Thus, this subspecies is on average smaller than the nominate with limited overlap in size ranges of wing and tail in each adult sex. Taking this and the two island populations' allopatry into account it seems on balance more useful to recognise their differences than to conceal them, notwithstanding their possibly questionable status (Cracraft, 1992).

Manucodia jobiensis Jobi Manucode (Table 9)

A♀ similar to or slightly smaller than A♂ in size, proportions and notably weight, MWL, MTL and MW by 4, 5 & 21% respectively. I♂ and I♀ smaller than respective adults in MWL (3 & 2%) and MTL (4 & 6%), but samples small. Thus, tail length increases with age in both sexes. MTL 76 & 75% of MWL in A♂ and A♀ respectively. The adult tail/wing index for both sexes combined ranges from 72-76%, these figures within the range of those (69-78%) presented by Coates (1990). MLL and MBL of A♀ 3 & 5% shorter than in A♂ respectively, but similar in proportion to MWL in both sexes.

We can generally reconcile our measurements with those for the species by Gilliard (1969), but not at all with Cooper & Forshaw's (1977) sizes of 168-173mm for wing and 42-44mm for tarsus for A♂ and 165-172mm for wing and 40-45mm for tarsus for A♀ of nominate, which are exclusively too small (wing) or too large (tarsus).

1) *M. j. jobiensis* Salvadori, 1876. Annals Museo Civico Genova 7 (1875): 969. Wonapi, Jobi (= Yaten) I. Only known from Yaten I in Geelvink Bay, west Irian Jaya.

2) *M. j. rubiensis* Meyer, 1885. Zeitschrift für die gesammte Ornithologie 2: 374. Rubi, Geelvink Bay. Now known from the mainland coast

of northern New Guinea adjacent to Yapen I eastward to the Astrolabe Bay area of Papua New Guinea and south in the west to the upper Setekwa R and in the east the upper Ramu R. MWL and MTL shorter than nominate, by 5 & 6% and 3 & 2% in A♂ and A♀ respectively. Thus, the mainland birds are on average smaller than those on Yapen I (Gilliard, 1969). As samples of the latter are small (n = 6), and wing and tail lengths ranges of mainland birds in fact entirely overlap those of the nominate island form, the validity of this subspecies remains in doubt. Gilliard (1969) described *rubiensis* as similar to *jobiensis* (♂ wing length of latter 177-179mm, tail 132-142mm), but smaller (♂ *rubiensis* wing length 168-174mm, tail 127-133mm). Present data are inadequate to justify the retention of *rubiensis* and on the basis of this we agree with Cracraft (1992) that it should be synonymised with *jobiensis*, but more data are clearly required.

Manucodia keraudrenii Trumpet Manucode
(Table 10)

A♀ similar to or slightly smaller than A♂ in size, proportions and notably weight, MWL, MTL and MW by 4, 5 & 12% respectively. I♂ and I♀ smaller in MWL (5 & 3%) and lighter (sample small) than respective adults, but only I♂ MTL negligibly shorter (2%). Thus, tail length increases only slightly with age in ♂, those of I♀ and A♀ being similar. MTL 78% of MWL in both sexes. The adult tail/wing index for both sexes combined ranges from 73-78%, these figures being within the range of those (70-81%) presented by Coates (1990). MLL and MBL of A♀ 3 & 5% shorter than in A♂ respectively, but similar in proportion to MWL in both sexes. Proportionate bill length is remarkably consistent, MBL 21% of MWL in all subspecies except *hunsteini* and *gouldii* for which it is 20%.

A difficult species complex within which Gilliard (1969) acknowledged eight subspecies, which Cracraft (1992) reduced to seven ('species') by synonymising *M. k. mayeri* with *M. k. purpureoviolaceus*. To these, Cracraft (1992) added two newly described forms. Cracraft's (1992) efforts notwithstanding, more collecting and study of this species are required to meaningfully understand distributions and intraspecific variation given the patchiness of collecting on mainland New Guinea and the subjective nature of plumage characters used (colour and quality of refracted light in the form of iridescence). The length of the lanceolate 'ear tufts' are also used in

subspecific diagnosis (Gilliard, 1969; Cracraft, 1992). Data for 10 subspecies are presented, eight as acknowledged by Gilliard (1969) and the two described by Cracraft (1992).

1) *M. k. keraudrenii* (Lesson & Garnot), 1826. Bulletin Scientifiques Naturelles (Ferussac) 8: 110. Dorey, Vogelkop, north-western New Guinea. MTL 19 ± 4 mm (n = 24) & 18 ± 2 mm (n = 15) in A♂ and A♀ respectively. MTL 78% of MWL in adults.

2) *M. k. gouldii* (Grey), 1859. Proceedings of the Zoological Society of London note, p. 158. Cape York. Like nominate but plumage iridescence more green, less purple (particularly so on the upperwing and tail). Ear tuft feathering more narrowly pointed, MTL 34 ± 6 mm (n = 33) & 29 ± 4 mm (n = 16) in A♂ and A♀ respectively. This is much longer than in *keraudrenii*, but not longer than in *purpureoviolaceus* (pace Cracraft, 1992). MTL proportionately long, 81% of MWL in adults.

3) *M. k. jamesii* (Sharpe), 1877. Catalogue of Birds in the British Museum 3: 181, Aleya, Hall Sound, British New Guinea. Throat and breast dark metallic blue, washed with green, lacking purple of nominate. Ear tufts longer than in nominate, MTL 27 ± 5 mm (n = 25) & 24 ± 7 mm (n = 25) in A♂ and A♀ respectively. MTL 78% of MWL in adults.

4) *M. k. hunsteini* (Sharpe), 1882. Journal of the Linnean Society of London 16: 442. East Cape, New Guinea in error for Normanby I. Back, rump and uppertail are dark bluish-purple (less green) and the ear tuft feathers are less blue and more green than nominate. Generally like nominate, but much larger overall, MWL and MTL by 18 & 12% and 20 & 15% in A♂ and A♀ respectively. Ear tufts also longer, MTL 26 ± 3 mm (n = 11) & 22 ± 3 mm (n = 8) in A♂ and A♀ respectively. MTL 74% of MWL in adults, so proportionately the shortest of all subspecies.

5) *M. k. purpureoviolaceus* (Meyer, 1885). Zeitschrift für die gesammte Ornithologie 2: 375, pl. 15. Astrolabe Mts. Generally like nominate but larger with back, breast and belly intensely iridescent violet-purplish. Ear tufts notably long, MTL 38 ± 6 mm (n = 35) & 34 ± 4 mm (n = 29) in A♂ and A♀ respectively. MTL 76% of MWL in adults.

6) *M. k. neumannii* (Reichenow, 1918). Journal für Ornithologie 66: 438. Lordberg. Like similar-sized nominate but lower back, rump, uppertail and wings dark black-bluish washed iridescent deep violet-purple, not more greenish. Breast and belly dark metallic blue, MTL 13 ± 1 mm (n =

9) & 11 ± 1 mm (n=8) in A♂ and A♀ respectively and similar to those of an otherwise overall larger *adelberti*. MTL 80% of MWL in adults.

7) *M. k. mayri* (Greenway, 1942). Proceedings of the New England Zoological Club 19: 51. Wau, Morobe District, north-eastern New Guinea. Near-identical in size/plumage to *purpureoviolaceus* and ear tufts also notably long, METL 38 ± 11 mm (n=7) & 37 ± 6 mm (n=4) in A♂ and A♀ respectively. MTL 78% of MWL in adults. The supposed evidence of a higher wing-tail index in *mayri* than in *purpureoviolaceus* (Gilliard, 1969) is meagre given limited numbers of specimens of the former. As no other characters including ear tuft length appear to differentiate them, we concur with Cracraft (1992) that *mayri* should be synonomised with *purpureoviolaceus*.

8) *M. k. adelberti* (Gilliard & LeCroy, 1967). Bulletin of the American Museum Natural History 138: 72. Nawau, Adelbert Mts. Generally similar to nominate but like *M. k. neumanni*, with upper wings and tail more green (not, or far less, blue to purple). Ear tufts shorter than other forms except *neumanni*, METL 13 ± 2 mm (n=10) & 14 mm (n=1) long in A♂ and A♀ respectively. MTL 80% of MWL in adults.

9) *M. k. aruensis* (Cracraft, 1992). Cladistics 8: 10. Wanoem Bay, Kobror I, Aru I, West Irian. Much less green than nominate and differ from adjacent mainland New Guinea *jamesii* by being generally much darker and bluer, less green. Upperparts, particularly back, suffused purple, and lanceolate head feathering deeper, more purple, cobalt blue than in *jamesii*. A♂ slightly larger than nominate in MWL (5%) and more so in MTL (10%). Ear tuft length most similar to nominate, METL 22 ± 4 mm (n=4) in A♂ and thus much shorter than *jamesii*. MTL proportionately the longest, 82% of MWL in adults.

10) *M. k. diamondi* (Cracraft, 1992). Cladistics 8: 12. Awande, near Okapa, Eastern Highlands District, Papua New Guinea. Similar to *purpureoviolaceus* but defined as distinct from it in having back, upperwings and tail with strong violet-purple sheens, the breast and belly dark metallic blue with little or no violet-purple, and lanceolate head feathering bluish-green as opposed to greenish-blue washed violet-purple. Ear tufts slightly longer than in *purpureoviolaceus*, METL 40 ± 9 mm (n=11) & 34 ± 1 mm (n=4) in A♂ and A♀ respectively, and longer than in other subspecies. MTL 76% of MWL in adults.

Paradigalla carunculata Long-tailed Paradigalla (Table 11)

A♀ markedly smaller than A♂ in most measurements, MWL and MTL by 11 & 5% respectively. Tails of I♂ similar in length to A♀. MTL shorter than MTCL in A♀ (5%), I♂ (7%) and A♂ (18%). Thus, ♂ acquire a progressively longer tail with age, the central pair increasing considerably in length (20%) and at a far greater rate than the remainder. MTL 71 & 76% of MWL in A♂ and A♀ respectively (contra *P. brevicauda*), so proportionately longer in the ♀. MLL and MBL of A♀ 7 & 2% shorter than in A♂ respectively, but as a proportion of MWL negligibly (2 & 3%) longer.

Wing lengths of 152-157 mm for A♂ and 152-159 mm for A♀ of Cooper & Forshaw (1977) are dramatically/exclusively shorter than ours for the former and near exclusively shorter for the latter sex.

1) *P. c. carunculata* Lesson, 1835. Histoire naturelle des oiseaux de paradis et des épimaques 1835: 242. Arfak Mts.

2) *P. c. intermedia* Ogilvie-Grant, 1913. Bulletin of the British Ornithologists' Club 31: 105. Utakwa R, Nassau Ra, at 5,500 ft. The status of the long problematical form *P. c. intermedia* has been recently discussed in detail, and we note here only that it is an invalid taxon as the only three known specimens have been shown to be relatively young individuals of *P. brevicauda* (Frith & Frith, in press). Its biometrical data are therefore included within *P. brevicauda*.

This species is distinctively different from *P. brevicauda* in size, relative proportions and in sexual dimorphism of these characters. Younger individuals of *carunculata* have a shorter tail than adults, whereas in *P. brevicauda* younger birds have a considerably longer one than adults.

Paradigalla brevicauda Short-tailed Paradigalla (Table 12)

P. brevicauda Rothschild & Hartert, 1911. Novitates Zoologicae 18: 159. Mt Goliath, central Dutch New Guinea. Monotypic. Synonym: *P. b. intermedia* (see *P. c. intermedia*). A♀ similar to or slightly smaller than A♂. MWL and MW by 5 & 6% respectively. MTCL only 2 & 1 mm shorter than MTL in A♂ and A♀ respectively. A♀ MTL, however, is considerably longer (28%) than A♂. MTL of I♂ also much longer (47%) than A♂, and I♀ also have a longer (31%) tail than A♀ (sample small). Thus, ♂ acquire a progressively shorter (32%) tail, the central pair also

decreasing in relative length (35%) with age. MTL 34% of MWL in A♂, but 45% in A♀, so proportionately much longer in A♀. MLL of A♀ 5% longer than in A♂, but as a proportion of MWL the same. MBL similar in both sexes, but as a proportion of MWL negligibly (2%) longer in A♀ than A♂.

A stated average tail length of 90mm for this species is too long (pace Cooper & Forshaw, 1977).

Ptiloris paradiseus Paradise Riflebird
(Table 13)

P. paradiseus Swainson, 1825. Zoological Journal 1: 479. No type locality (= northern New South Wales). Monotypic. A♀ average smaller than A♂, MWL and MW (sample small) by 10 & 26% respectively. A♀ also slightly smaller (3%) in both MWL and MTL than I♂ and lighter (9%, but small sample), MTL of A♀ shorter (7%) than in A♂, but as a proportion of MWL negligibly (2%) longer. MTL of I♂ (sample small) also shorter (4%) than A♂. MTCL 4, 3 & 9% shorter than MTL in A♀, I♂ and A♂ respectively. Thus, ♂ acquire a slightly overall longer tail with age, unlike other *Ptiloris* species, but subsequent tail centrals decrease slightly in actual length with age. MLL of A♀ 3% shorter than in A♂, but as a proportion to MWL similar in both sexes. MBL of A♀ 8% longer than A♂ and as a proportion of MWL 7% longer.

For discussion of 'reversed' sexual dimorphism in bill length, see Frith (in press).

Ptiloris victoriae Victoria's Riflebird
(Table 14)

P. victoriae Gould, 1850. Proceedings of the Zoological Society of London 1849: 111. Barnard Is, North Queensland. Monotypic. A♀ average smaller than A♂, MWL and MW by 10 & 18% respectively. A♀ also slightly smaller in MWL and MTL (3 & 4%) than I♂ and lighter (7%), MTL of A♀ shorter (4%) than in A♂, but as a proportion of MWL slightly (4%) longer. MTCL only 3% shorter in A♀ and I♂, but 5% shorter in A♂. Thus, although very little variation in tail length between A♂ and I♂, tail centrals do decrease slightly in length with age. MLL of A♀ 6% smaller in A♂, but as a proportion of MWL similar in both sexes. MBL of A♀ 4% longer than A♂ and as a proportion of MWL 5% longer.

Cooper & Forshaw's (1977) A♀ tarsal length range of 34-39 mm is exclusively longer than we

found. For a discussion of 'reversed' sexual dimorphism in bill length, see Frith (in press).

Ptiloris magnificus Magnificent Riflebird
(Table 15)

A♀ markedly smaller than A♂, MWL and MW by 19 & 34% respectively. MWL of A♀ exclusively shorter than A♂. A♀ considerably smaller in MWL and MTL (12 & 8%) than I♂, and much lighter (27%) — more so than the other two *Ptiloris* species. MTL of A♀ shorter (3%) than in A♂, but as a proportion of MWL much (10%) longer. MTL of I♂ longer (7%) than A♂. MTCL and MTL similar in A♀ and I♂, but 5% shorter in A♂. Thus, ♂ acquire a progressively shorter (6%) tail, tail centrals decreasing (11%) in length at a greater rate with age. MLL and MBL of A♀ 10 & 11% shorter than in A♂ respectively, but as a proportion of MWL negligibly (2 & 3%) longer.

Tarsal lengths of Cooper & Forshaw (1977) are almost longer and are exclusively longer than ours for A♂ and ♀ respectively.

1) *P. m. magnificus* (Vieillot, 1819). Nouveau Dictionnaire d'Histoire Naturelle, nouveau édition, 28: 167. 'Nouvelle Guinée', restricted to Dorey, Vogelkop.

2) *P. m. alberti* Elliot, 1871. Proceedings of the Zoological Society of London, p. 583. Cape York, Australia. MWL of A♂ c. 11 mm shorter and MTL, MLL fractionally less, and bill narrower and conspicuously more decurved than in other two subspecies. Extent of culmen base feathering is intermediate between that of nominate *magnificus* and *intercedens*. MTCL of A♂ relatively shorter (8 mm) than rest of tail than in other two subspecies (both 5 mm).

3) *P. m. intercedens* Sharpe, 1882. Journal of the Linnean Society of London, Zoology 16: 444. Milne Bay and East Cape, south-eastern New Guinea. In almost all mean measurements of both sexes and all age classes this subspecies is all but identical to nominate except for MBL being c. 4 mm less. Bill straighter than that of *alberti*.

There are striking differences in ♂ advertisement call between the subspecies (first noted by Hunstein, in Sharpe 1891) but also within the populations of *P. m. alberti* (pers. obs.). In *P. m. magnificus* and *P. m. alberti* the culmen is unfeathered along the ridge while in *P. m. intercedens* only a small proportion of the culmen base is unfeathered. The flank plumes in *P. m. magnificus* and *P. m. alberti* are longer than the tail but in *P. m. intercedens* they are equal to or shorter than the tail. In view of these differences it has

been suggested that *P. m. intercedens* might represent a distinct sibling species (Beehler & Swaby, 1991). Because the feathered condition of the culmen base in Australian *P. m. alberti* is intermediate between *intercedens* and nominate *magnificus* and that the Australian population exhibits considerable geographical variation in vocalization within its small range (MacGillivray, 1918; Frith & Beehler, in prep.; pers obs.), however, we here treat *intercedens* as a subspecies. A hybrid specimen between *P. m. intercedens* and *P. m. magnificus*, was collected at Putei (CSIRO 4112), just to the east of the Purari R. The subspecies *P. m. intercedens* is confined to the east of this river on the New Guinea south coast and *P. m. magnificus* otherwise known from well to the west of it (Beehler & Swaby, 1991).

Semioptera wallacei Standardwing Bird of Paradise (Table 16)

A♀ average smaller than *A♂*, MWL and MW by 8 & 17% respectively. MTL of *A♀* longer (5%) than in *A♂* and as a proportion of MWL 8% longer. MTL of *I♂* also longer (7%) than *A♂*. MTL and MTCL similar in *A♀* and *I♂*, but 15% shorter in *A♂*. Thus, *♂* acquire a progressively shorter tail, tail centrals decreasing considerably (21%) in length and more so with age. MLL of *A♀* 6% shorter than in *A♂*, but as a proportion to MWL similar in both sexes. MBL of *A♀* 3% shorter than in *A♂*, but as a proportion of MWL negligibly (2%) longer. Standards average 154 ± 13mm (n = 58) long in *A♂*.

1) *S. w. wallacei* Gray, 1859. Literary Gazette (new series) 39: 406. Near Labuha Village, Bacchian (= Bacan) I.

2) *S. w. halmaherae* Salvadori, 1881. Ornitologia della Papuasia e della Molucche 2: Torino, p. 73. Halmahera. Similar to nominate but crown and nape (and in some individuals also mantle) with rich pinkish coppery-purple iridescence. MWL as in the nominate, MTL longer and other measurements slightly smaller.

Seleucidis melanoleuca Twelve-wired Bird of Paradise (Table 17)

A♀ average slightly smaller than *A♂*, MWL and MW by 6 & 11% respectively. MTL in *A♀* much (and exclusively) longer (49%) and as a proportion of MWL far greater (64%) than in *A♂* (40%). MTL of *I♂* similar to *A♀*. MTCL negligibly shorter than MTL in both sexes and all ages. Thus, *♂* acquire a progressively and grossly

shorter (35%) tail with age. MLL and MBL of *A♀* 7 & 9% shorter than in *A♂* respectively, but similar in proportion to MWL in both sexes. MFPL 266 ± 35mm (n = 48) in *A♂*.

1) *S. m. melanoleuca* (Daudin, 1800). Traité d'Ornithologie (Lesson) 2: 278. Waigiou, in error for Salawati or the Vogelkop.

2) *S. m. auripennis* Schlüter, 1911. Falco 7: 2. Dallmannshafen (= Wewak), German New Guinea. Similar to but on average generally smaller (c. 6%), more so in MBL, than nominate and underparts of *♀* darker, more brownish, and more heavily barred.

Epimachus albertisi Buff-tailed Sicklebill (Table 18)

A♀ similar to *A♂* in size and weight, MWL only 3% smaller. MTL of *A♀* also shorter (4%) and has the same (84%) proportionate length to MWL as *A♂*. MTL of *I♂*, however, negligibly (2%) longer than *A♂*. Thus, surprisingly, *♂* decrease tail length very slightly with age, but data are equivocal. MLL similar in both sexes and in the proportion to MWL. MBL of *A♀* 4% longer than in *A♂* and as a proportion of MWL 3% longer.

Tail length and tail centrals of this species and *E. bruijnii* are of similar lengths in both sexes and all ages, and tail length is shorter than wing length. These two species, because of the consistent proportional and tail growth differences between them and the two larger *Epimachus* species (*fastuosus* and *meyeri*), were long treated as the separate genus *Drepanornis* (Gilliard, 1969). We here follow current usage (Diamond, 1972; Beehler & Finch, 1986; Beehler et al., 1986) but note the above differences suggest Cracraft (1992) was correct in treating *Drepanornis* as valid.

1) *E. a. albertisi* (Sclater, June 1873). Nature 8: 151 and (1873) Proceedings of the Zoological Society of London p. 558, pl. 47. Hatam, Arfak Mts. MTL 87% of MWL in adults and proportionately longest in this subspecies.

2) *E. a. cervinicauda* Sclater 1883. Proceedings of the Zoological Society of London, p. 578. Vicinity of Port Moresby. Upperparts in both sexes brown with slightest of chestnut suffusion, uppertail coverts and tail paler chestnut than in nominate. Underparts of *♀*-plumaged birds pale buff barred strongly with paler brown than *albertisi*. Smaller than nominate. MTL 82% of MWL 82% in adults.

3) *E. a. geisleri* (Meyer, 1893). Abhandlungen und Berichte des Königlichen Zoologischen und Anthropologisch-Ethnographischen Museums zu Dresden 4: 15. Sattelberg, Huon Peninsula. MWL and MTL fractionally smaller than nominate; those of $A\delta$ fall within the ranges given for the nominate but those of $A\varphi$ are exclusive, but samples too small ($n = 9$) for meaningful comparisons. Diamond (1972), Cooper & Forshaw (1977), Coates (1990) and Cracraft (1992) concluded that *geisleri* should be combined with the nominate, notwithstanding the slightly smaller size of the former. We concur with this.

4) *E. a. inversus* Rothschild, 1936. Mitteilungen aus dem Zoologischen Museum, Berlin 21: 188. Mt Kunapi, Weyland Mts. Samples too small ($n = 5$) for significant biometrical comparisons, but measurements similar to nominate. Diamond (1972), Cooper & Forshaw (1977), Coates (1990) and Cracraft (1992) concluded that *inversus* should be combined with the nominate, and we concur.

By synomising *geisleri* and *inversus* with *albertisi*, MTL and MWL of both $A\delta$ and $A\varphi$ of the resulting *albertisi* are still larger than those of *cervinicauda* and MTL 87% of MWL and proportionately still longer.

Epimachus bruijnii Pale-billed Sicklebill (Table 19)

E. bruijnii (Oustalet, 1880). Annales des Scientifiques Naturelles, Paris ser. 6, 9, 1. and 1880 Bulletin de l' Association Scientifiques, France, p. 172. Coast of Geelvink Bay between $136^{\circ}30'$ and 137° of longitude. Monotypic. A φ similar to $A\delta$ in size and weight, MWL and MW by 3 & 9% smaller respectively. MTL in adults of both sexes almost identical with a similar (69 & 70%) proportionate length to MWL. MTL of $I\delta$, however, longer (5%) than $A\delta$. Thus, surprisingly, δ tail length decreases very slightly with age, but data are equivocal. MLL and MBL of $A\varphi$ 3 & 5% shorter than in $A\delta$ respectively, but as a proportion to MWL similar in both sexes.

The adult tail length of 16cm for the species by Cooper & Forshaw (1977) is far too long.

Epimachus fastuosus Black Sicklebill (Table 20)

$A\varphi$ markedly smaller than $A\delta$, MWL, MTL and MW by 15, 44 & 30% respectively. MTL of $A\delta$ and $A\varphi$ 100 & 32% proportionately longer than MWL, as in *E. meyeri*. MTL of $A\varphi$ and $I\delta$ 24 & 23% shorter than MTL respectively, but

in $A\delta$ this difference far greater (45%). Thus, δ acquire progressively longer tails with increasing age, the tail centrals more than doubling in length. MLL and MBL of $A\varphi$ 7 & 3% shorter than in $A\delta$, but as a proportion of MWL slightly (3 & 5%) longer.

It is not true that $I\delta$ can be told apart from φ in the field by their longer and thicker bills (contra Majnep & Bulmer 1977).

1) *E. f. fastuosus* (Hermann, 1783). Tabula affinitatum animalium (Argentorati), p. 195 (based on Daubenton, Planches Enluminées, pls 638-639). New Guinea, restricted to Arfak Mts (Hartert 1930).

2) *E. f. atratus* (Rothschild & Hartert), 1911. Novitates Zoologicae 18: 160. Mt Goliath, Oranje Mts, Dutch New Guinea. $A\delta$ darker on underparts and $A\varphi$ more olive, less rufous, on uppertail than *fastuosus*. $A\delta$ measurements similar to nominate, but some variation between $A\varphi$, notably in tail length (6% shorter).

3) *E. f. stresemanni* Hartert, 1930. Novitates Zoologicae 36: 34. Schraderberg, Sepik Mts. $A\delta$ darker on underparts than nominate but a Leiden Museum specimen of *stresemanni* from Anggi Gita, Arfak Mts, is intermediate in this character. This subspecies is considerably larger than the nominate in every respect. It is also larger than *atratus*, with which it has been synomised, MWL, MTL and MW (sample small) of $A\delta$ being 9%, 17% & 18% longer respectively. This notwithstanding, the subspecies is considered invalid given observations of Gilliard & LeCroy (1961), Diamond (1969) and Cracraft (1992) concerning the clinal nature of otherwise on average larger *stresemanni*. When *stresemanni* is synomised with *atratus*, however, the latter becomes a taxon of much larger individuals, still larger than the nominate.

4) *E. f. ultimus* Diamond, 1969. American Museum Novitates 2362: 31. Summit of Mt Menawa, Bewani Mts, Sepik District, Mandated Territory of New Guinea. Differs from nominate, but resembles *atratus* (and *stresemanni*), in being more black, less brown, on underparts of $A\delta$ and more olive, less rufous, on uppertail of $A\varphi$. Bill nearly exclusively shorter (sample small) than individuals of other subspecies

Epimachus meyeri Brown Sicklebill (Table 21)

$A\varphi$ markedly smaller than $A\delta$, MWL, MTL and MW by 14, 20 & 29% respectively. MTL of $A\delta$ and $A\varphi$ 39 & 28% longer than MWL respectively. MTL of $A\varphi$ and $I\delta$ is 32 & 35% shorter

than MTCL respectively, but in $A\delta$ 64%. Thus, δ acquire progressively longer tails with increasing age, the tail centrals more than doubling in length. MLL of $A\varphi$ 9% shorter than in $A\delta$, but similar in proportion to MWL in both sexes. MBL of $A\varphi$ 3% longer than in $A\delta$, but as a proportion of MWL 6% longer.

Cooper & Forshaw's (1977) tarsal lengths of 58-62mm and 51-59mm for nominate $A\delta$ and φ respectively are much larger than we found, with those of the former sex exclusively so. It is not true that $I\delta$ can be told apart from φ in the field by their longer and thicker bills (*contra* Majne & Bulmer, 1977).

1) *E. m. meyeri* Finsch, 1885. *Zeitschrift für die gesammte Ornithologie* 2: 380. Huseisengebirge, south-eastern New Guinea. Flank plumes are fawn brown. $A\delta$ and $A\varphi$ larger than other subspecies with respect to MWL, MTL, MTCL, MBL and MW.

2) *E. m. albicans* (Van Oort, 1915). *Zoologische Mededelingen*, Leiden 1: 228. Treubivak (2366m), Treub Mts, Central New Guinea. Like nominate but slightly smaller, and flank plumes of $A\delta$ paler than both *meyeri* and *bloodi* in being white.

3) *E. m. megarhynchus* Mayr & Gilliard, 1951. *American Museum Novitates* 1524: 10. Gebroeders Mts, Weyland Ra, Dutch New Guinea, 6000-7000ft. The subspecies *megarhynchus* was erected on the basis of a larger bill than the others, but bill lengths of the only three specimens known (δ 82, φ 79, 83mm) in fact fall within the range of all subspecies (see measurements); see also Cracraft (1992). This subspecies is now considered synonymous with *albicans* (Cracraft, 1992), with which we concur.

4) *E. m. bloodi* Mayr & Gilliard, 1951. *American Museum Novitates* 1524: 10. Mt Hagen, Central Highlands, Mandated Territory of New Guinea, 8300ft. Like nominate but a good deal smaller and lighter. Flank plumes of $A\delta$ paler, more dirty whitish, than dirty pale brownish of *meyeri*.

Astrapia nigra Arfak Astrapia (Table 22)

A. nigra (Gmelin, 1788). *Systema Avium* 1: 401. 'Oceanic Islands', restricted to the Arfak Mts, New Guinea. Monotypic. $A\varphi$ slightly smaller than $A\delta$, MWL by 8%. MTL 116 & 52% longer than MWL in $A\delta$ and $A\varphi$ respectively. MTL in $A\varphi$ and $I\delta$ shorter than in $A\delta$ by 35 & 33% respectively. MTL of $A\varphi$, $I\delta$ and $A\delta$ 17, 19 &

30% shorter than MTCL respectively. Thus, δ tail length progressively increases considerably with age, MTL and MTCL increasing by 50 & 74% respectively. In this respect this species is similar to *A. rothschildi* and unlike their congeners. MLL of $A\varphi$ 4% shorter than in $A\delta$, but similar in proportion to MWL in both sexes. MBL similar in both sexes, but as a proportion to MWL negligibly (2%) longer in $A\varphi$.

Astrapia splendidissima Splendid Astrapia (Table 23)

$A\varphi$ closer to $A\delta$ in general size than most bird of paradise species, MWL similar but MW 11% less — unlike all congeners. MTL 27 & 39% longer than MWL in $A\delta$ and $A\varphi$ respectively. MTL of $A\varphi$ and $I\delta$ longer than $A\delta$ by 8 & 12% respectively. MTL of $A\varphi$, $I\delta$ and $A\delta$ 11, 13 & 20% shorter than MTCL respectively. Thus, δ tail length decreases slightly with age, more so MTL (11% shorter) than MTCL (4% shorter). MLL of $A\varphi$ negligibly (2%) shorter than in $A\delta$, but similar in proportion to MWL in both sexes. MBL similar in both sexes, and also as a proportion of MWL. It is presumably as a result of the reduced overall body size of this species that MBL is large proportionate to MWL (30%) compared to other *Astrapia* species (20-25%).

1) *A. s. splendidissima* Rothschild, 1895. *Novitates Zoologicae* 2: 59, pl. 5. 'Probably Charles-Louis Mts' but instead almost certainly from Weyland Mts (Mayr, 1941).

2) *A. s. helios* Mayr, 1936. *American Museum Novitates* 869: 3. Mt Goliath, Oranje Ra, Dutch New Guinea. Like the nominate but crown, neck and dorsal collar of $A\delta$ more bluish and less golden-green, and spatulate tips of central tail feather pair broader. Female-plumaged birds slightly darker above. Birds of both sexes and all age classes differ from nominate by having extensive, unconcealed, white bases to underside of outer primaries except outermost two, this character being previously overlooked (Mayr, 1936; Gilliard, 1969; Cracraft, 1992). These characters and the fact that individuals of *helios* are on average larger than the nominate, particularly in overall tail length (central pair = 15mm longer in $A\delta$ and 8mm in $A\varphi$), contradict Cracraft's (1992) view that *helios* is invalid.

3) *A. s. elliotsmithi* Gilliard, 1961. *American Museum Novitates* 2031: 3. Mt Ifal, 7,200ft asl, Victor Emanuel Mts, Mandated Territory of New Guinea. This subspecies resembles *helios*, but its tail is even longer (central pair = 17mm longer in

$A\delta$ and 12mm in $A\varphi$). We agree with Cracraft (1992) in synonymising *elliottsmithi* with *helios* and concur with his reservations, as the slightly larger average size of this subspecies appears no more than the extreme of a west to east clinal increase in the species and because its white primary bases are of the *helios* kind and are unlike those of the nominate. Synonymising these two subspecies increases the average size of resulting *helios*, especially tail length, the central pair being 20mm longer in $A\delta$ and 12mm in $A\varphi$ than in the nominate.

Astrapia mayeri Ribbon-tailed Astrapia
(Table 24)

Astrapia mayeri Stonor, 1939. Bulletin of the British Ornithologists' Club 59: 57. 'Eighty to a hundred miles west of Mt Hagen' [Station] = Mt Hagen, PNG.

$A\varphi$ markedly smaller than $A\delta$, MWL and MW by 12 & 10% respectively. MTL 62 & 97% of MWL in $A\delta$ and $A\varphi$ respectively. MTL of $A\varphi$ and $I\delta$ longer than $A\delta$ by 37 & 46% respectively. MTL of $A\varphi$, $I\delta$ and $A\delta$ 50, 46 & 88% shorter than MTCL respectively. Thus, MTL of $A\delta$ decreases considerably in length with age (by 32%), whereas MTCL increase dramatically (198% longer), MLL of $A\varphi$ 4% shorter than in $A\delta$, but as a proportion of MWL negligibly (2%) longer. MBL similar in both sexes, but as a proportion of MWL negligibly (2%) longer in $A\varphi$.

Astrapia stephaniae Stephanie's Astrapia
(Table 25)

$A\varphi$ on average slightly smaller than $A\delta$, MWL and MW by 9% & 12% respectively. MTL only 85% MWL in $A\delta$, but in $A\varphi$ 25% longer. MTL of $A\delta$ shorter than $A\varphi$ and $I\delta$ by 25 & 27% respectively. MTL of $A\varphi$, $I\delta$ and $A\delta$ 40, 43 & 77% shorter than MTCL respectively. Thus, MTL of $A\delta$ decreases considerably with age (27% shorter), whereas MTCL increases (85% longer). In $A\delta$, rectrices other than the central pair are not proportionately greatly reduced in length as in *A. mayeri*, but progressively decrease in length with age synchronously with grossly increasing central rectrices length. MLL of $A\varphi$ 4% shorter than in $A\delta$, but as a proportion of MWL similar in both sexes. MBL similar in both sexes, but as a proportion of MWL slightly (3%) longer in $A\varphi$ than in $A\delta$. MBL of both sexes much longer (13%), and also longer (3%) as proportion of MWL, than in the closely related *A. mayeri*.

1) *A. s. stephaniae* (Finsch & Meyer, 1885). Zeitschrift für die gesammte Ornithologie 2: 378. Hufeisengebirge.

2) *A. s. feminina* Neumann, 1922. Verhandlungen der Ornithologischen Gesellschaft in Bayern 15: 236. Schraderberg. MWL of $A\delta$ slightly shorter (3%) than *stephaniae* but the same as in *ducalis* whereas MTL the same as *stephaniae* but larger than *ducalis*, but samples too small ($n=2$) for meaningful comparisons.

3) *A. s. ducalis* Mayr, 1931. Mitteilungen aus dem Zoologischen Museum, Berlin 17: 711. Dawong, Herzog Mts. Like nominate but less contrast between colour of crown/neck and the back, and the crown and neck more bluish-black. On average smaller than the nominate in all significant characters. Confusion over the supposed range of *feminina* (*sensu stricta*) exists: Gyldenstolpe (1955) and Coates (1990) included the Wahgi-Sepik Divide, which is considered by others to be occupied by *ducalis* (Mayr & Gilliard, 1952; Gilliard, 1969). We note Cracraft's (1992) observations and tentatively agree with him in relegating *ducalis* to synonymy with *feminina*, while noting their general overlap in measurements.

Astrapia rothschildi Huon Astrapia
(Table 26)

A. rothschildi Föhrster, 1906. Two New Birds of Paradise: 2. Rawlinson Mts, north-eastern New Guinea. Monotypic. $A\varphi$ markedly smaller than $A\delta$, MWL and MW (small sample) by 12% & 23% respectively. MTL as a proportion of MWL 87 & 33% longer in $A\delta$ and $A\varphi$ respectively. MTL of $A\delta$ shorter than those of $A\varphi$ and $I\delta$ by 38 & 36% respectively. MTL of $A\varphi$, $I\delta$ and $A\delta$ 14, 12 & 21% shorter than MTCL respectively. Thus, δ tail length increases considerably with age, MTL & MTCL by 56 & 74% respectively. Unlike other *Astrapia* species, except *A. nigra*, rectrices other than the central pair do not decrease in length with age but become progressively longer as does the central pair. MLL of $A\varphi$ 4% shorter than in $A\delta$, but as a proportion to MWL negligibly (2%) longer. MBL similar in both sexes, but as a proportion to MWL slightly (3%) longer in $A\varphi$ than $A\delta$.

Lophorina superba Superb Bird of Paradise
(Table 27)

$A\varphi$ markedly smaller than $A\delta$, MWL and MW by 12 & 23% respectively. $A\varphi$ also smaller than $I\delta$, MWL, MTL and MW by 6, 3, & 12% respec-

tively. MTCL negligibly (1-2mm) longer than the outer rectrices in birds of all ages and sexes, and this is true for all subspecies. MTL shorter (7%) in A♀, but as a proportion of MWL longer (3%) than in A♂. MTL increases slightly (4%) with age in ♂, but data vary with subspecies. MLL of A♀ 7% shorter than in A♂, but as a proportion to MWL negligibly (2%) longer. MBL similar in both sexes, but as a proportion of MWL slightly (3%) longer in A♀ than A♂.

It is noteworthy that bill measurements of this species clearly illustrate a serious potential problem in measuring exposed culmen as opposed to bill length. Culmen measurements presented by Gilliard (1969) and Cooper & Forshaw (1977) suggest that the bill is longer in females than in males in this species. This is, however, an artifact of sexual dimorphism in the extent of forehead feathers and structure; in functional bill length *per se* there is no sexual dimorphism, while in proportionate bill length females are larger.

Complex subspeciation has long been debated, with various authors accepting different numbers of subspecies (Gilliard, 1969; Diamond, 1972; Coats, 1990; Cracraft, 1992). We list all subspecies below, compare their biometrical data and note which have been, or we consider should be, synonomised.

1) *L. s. superba* (Pennant, 1781). Specium Faunula Indica, in Forster's Indian Zoology, p. 40 (based on Daubenton, Planches Enluminées, pl. 632). New Guinea, restricted to Arfak Mts. A♀ blackish-brown on head and nape, except the chin and throat, with a short line of tiny whitish spots as a sub-obsolete, post-ocular, supercilium stripe. Mantle to upper tail coverts and wings dark reddish-brown. Upper tail fuscous with pale chestnut outer feather edging. Chin, throat and underparts pale buff to darker buff, uniformly and narrowly barred brownish-black. MTL 73 and 78% of MWL in A♂ and A♀ respectively. MWL and MTL of both sexes notably longer than in most other subspecies.

2) *L. s. minor* Ramsay, 1885. Proceedings of the Linnean Society of New South Wales 10: 242. Astolabc Mts, Mekeo, south-east New Guinea. A♀ blacker plumaged than other subspecies, with head and throat blackish-brown and upperparts rich dark chestnut. No supercilium stripe in front of and above eye and sub-obsolete behind it. No or little pale nape marking. MTL 67 & 70% of MWL in A♂ and A♀ respectively. MWL of A♂ and A♀ shorter (6 & 8%) than in the respective sexes of the nominate, as is MTL (14 & 16%). MWL of A♂ shorter than all other subspecies.

3) *L. s. latipennis* Rothschild, 1907. Bulletin of the British Ornithologists' Club 19: 92. Rawlinson Mts, Huon Peninsula. A♀ head dark brown, chin and throat whitish, with broad whitish supercilium stripe, white streaking on forehead, crown and nape; upperparts variably olive-brownish. MTL 70 & 71% of MWL in A♂ and A♀ respectively. Overall smaller than nominate, being most similar in size to *connectens* and *addenda* with which Cracraft (1992) has synonomised it. MTL of A♂ almost identical, but MTL longer than in *connectens* (4%) and *addenda* (7%).

4) *L. s. feminina* Ogilvie-Grant, 1915. Ibis, Jubilee Supplement 2: 27. Utakwa R, Nassau Ra. A♀ similar in general appearance to *latipennis*, the broad supercilium stripes joining narrowly across the nape. MTL 63% & 66% of MWL in A♂ and A♀ respectively. Thus, wings are proportionately much longer relative to tail length than in other subspecies.

5) *L. s. niedda* Mayr, 1930. Onithologische Monatsberichte 38: 179. Wondiwoi, and Wandammen Mts. A♂ like nominate in appearance, but ♀ plumage with distinctly darker underparts being more ochraceous. MTL 73% of MWL in A♂, but in A♀ this figure much larger (82%), as in the nominate, but samples small. In general and proportionate measurements most like the nominate.

6) *L. s. connectens* Mayr, 1930. Onithologische Monatsberichte 38: 180. Dawong, Herzog Mts. MTL 66 & 70% of MWL in A♂ and A♀ respectively. In general and proportionate measurements most like *addenda*, and similar to *latipennis*. Female plumage like *latipennis*. Considered virtually indistinguishable from *latipennis* by Diamond (1972), who considered it a synonym, and was followed by Cracraft (1992). We concur with Cracraft (1992) that *connectens* and *addenda* be synomised with *latipennis* (see below).

7) *L. s. sphinx* Neumann, 1932. Onithologische Monatsberichte 40: 121. One (type) ♀-plumaged specimen only for which the locality is unknown. Gilliard (1969) recognised this as a distinct subspecies with 'More reddish brown on upperparts than *minor*. Eyestripe less extensive and forehead and neck without white flanks'. Wing and tail lengths are markedly longer than those of *minor* and more like those of *latipennis*. Cracraft (1992) synonomised *sphinx* with *minor*, an action as acceptable as any. We note that the presence of *L. superba* on the Hunstein Ra is indicated by the hybrid *L. superba* x *P. carolae* previously known as *L. s. pseudoparotia* (Frith & Frith, 1996b). It is

therefore possible the type specimen of *sphinx* is from the Hunstein Ra (its measurements are in fact closer to those of geographically closest *addenda*).

8) *L. s. pseudoparotia* Stresemann, 1934. *Ornithologische Monatsberichte* 42: 144. Hunsteinspitze, middle Sepik. Until our visit to the Zoologisch Museum, Berlin, this subspecies was still recognised (Gilliard, 1969; Diamond, 1972; Cooper & Forshaw, 1977; Cracraft, 1992); however, the unique type specimen is, in fact, an individual resulting from the hybridization of *Lophorina superba* and *Parotia carolae* in the Hunstein Ra (Frith & Frith, 1996b). No other specimen of (normal) *L. superba* is known from this mountain range. The biometrical data of *pseudoparotia* are therefore excluded from Table 27.

9) *L. s. addenda* Iredale, 1948. *Australian Zoologist* 11: 162. Mt Hagen district. A ♀ plumage like *feminina* and *latipennis* but with some differences (Gilliard, 1969). MTL 65 & 70% of MWL in A♂ and A♀ respectively. Similarly size to *latipennis*, although MTL in A♂ 6% shorter. In general and proportionate measurements it is most like *connectens*, however. Placed in the synonymy *L. s. latipennis* by Cracraft (1992) on plumage morphology.

10) *L. s.* subspecies. We measured four individuals, one A♂, one SA♂ (with 15% A♂ plumage but otherwise in female plumage) and two A♀, from Wanuma, Adelbert Mts, Madang district. We, like Pratt (1982), could not assign these to a subspecies and they are much larger than any other taxon measured. Wing, tail, tarsal, bill lengths and bill width measured 144, 95, 33.5, 29.6 & 5.9mm in the A♂ and averaged 124, 84, 29.7, 29.5 & 6.3mm in A♀ (n = 2) respectively. As in other subspecies, the tail centrals of A♂ and A♀ are slightly longer (5 & 3mm respectively) than the remainder of the tail. A♂ wing and tail lengths are notably long, but the sample too small for meaningful comparison.

With regard to the validity of taxa in this species those accepted by Cracraft (1992) broadly agree with some or most doubts expressed by Gilliard (1969), Diamond (1972) and Coates (1990). Until such time as a comprehensive re-evaluation of its systematics indicates otherwise, we accept the following subspecies: *L. s. superba*, *niedda*, *minor* (*sphinx*), *latipennis* (*connectens*, *addenda*), *feminina*, with synonyms given in parentheses. *L. s. pseudoparotia* is invalid as detailed above.

Parotia wahnesi Wahnes' Parotia (Table 28)

P. wahnesi Rothschild, in Foerster & Rothschild, 1906. Two New Birds of Paradise: 2. Rawlinson Mts. Monotypic. A ♀ smaller than A♂ in MWL (almost exclusively so) and MW (sample small), by 7 & 15% respectively. MTL as a proportion of MWL 16 & 3% longer in A♂ and A♀ respectively, unlike all other *Parotia* species. MTL considerably shorter than MTCL, by 8% shorter in both A♀ & I♂ and 12% in A♂. MTL and MTCL in A♀ shorter (18 & 22% respectively) than A♂, the central pair exclusively so. MTL of I♂ longer (5%) than A♀, but shorter (18%) than A♂. Thus, ♂ tail length increases with age, MTCL more so (22%) than MTL (16%). MLL of A♀ 9% shorter than in A♂, but as a proportion of MWL similar in both sexes. MLL, as in all *Parotia* species, proportionately long for a typical bird of paradise, averaging 32% of MWL in A♂. MBL similar in both sexes, but as a proportion of MWL negligibly (2%) longer in A♀ than A♂. MOPL of A♂ average 138 ± 4 mm (n = 18). METL of A♂ longer (25 ± 4 mm, n = 15) than I♂ (15 ± 1 mm, n = 7) and A♀ (15 ± 2 mm, n = 17).

Parotia sefilata Western Parotia (Table 29)

P. sefilata (Pennant, 1781). *Specium Faunula Indica*, in Forster's *Indian Zoology*, p. 40. New Guinea, restricted to Arfak Mts. Monotypic. A ♀ smaller than A♂ in MWL (almost exclusively so) and MW, by 8 & 10% respectively. MTL 77 & 84% of MWL in A♂ and A♀ respectively. MTCL negligibly (1-3mm) longer than MTL in birds of all ages and sexes. MTL and MTCL of A♂ and A♀ similar, but I♂ 5% longer than adults of both sexes. I♂ 5% longer than adults of both sexes. Thus, ♂ tail length decreases slightly (4%) with age. MLL of A♀ 10% shorter than in A♂, but as a proportion of MWL similar in both sexes, averaging 32%. MBL similar in both sexes, but as a proportion of MWL negligibly (2%) longer in A♀ than A♂. Occipital plumes of A♂ average 175 ± 3 mm (n = 29). METL of A♂ longer (30 ± 3 mm, n = 28) than I♂ (16 ± 1 mm, n = 16) and A♀ (15 ± 1 mm, n = 24).

Parotia carolae Carola's Parotia (Table 30)

A ♀ smaller (7%) than A♂ in MWL (almost exclusively so) and considerably lighter (37%).

suggesting a far greater sexual dimorphism in weight, but samples too small for meaningful conclusions. MTL 50 & 64% of MWL in A♂ and A♀ respectively. MTL and MTCL similar in length in birds of all ages and sexes. MTL of A♀ and I♂ 19 & 25% longer than in A♂ respectively. Thus, ♂ tail length decreases considerably (20%) with age. MLL of A♀ 8% shorter than in A♂, but as a proportion of MWL similar in both sexes and averages 33%. MBL 6% longer in A♀ than in A♂, unlike other *Parotia* species, and as a proportion of MWL slightly (3%) longer. MOPL of A♂ 122 ± 7 mm (n = 28). METL of A♂ longer (22 ± 2 mm, n = 11) than I♂ (12 ± 1 mm, n = 7) and A♀ (12 ± 1 mm, n = 42).

This species presents a complex, and one of the most interesting, problems of intraspecific variation, which requires considerably more collecting over its range before a satisfactory study can be undertaken. The subspecific biometrics do not help greatly as sample sizes are small, the characters do not vary greatly in size between the subspecies, and relative proportions of MTL, MTL and MBL to MWL are remarkably similar throughout the species.

1) *P. c. carolae* Meyer, 1894. Bulletin of the British Ornithologists Club 4: 6. Amberno R (but apparently in fact Weyland Mts). MOPL 117 ± 3 mm (n = 11).

2) *P. c. berlepschi* Kleinschmidt, 1897. Onithologische Monatsberichte 5: 46. New Guinea. The Van Rees Mts of Irian Jaya have been suggested as the unknown home of this distinct subspecies (Mayr, 1962) as has the Foja Mts, Irian Jaya (Diamond, 1985). Only four specimens are known. Like nominate in size and appearance but upper neck, nape and mantle heavily bronzed and with throat black and spatulate tips to occipital plumes relatively very small; MOPL 126 ± 1 mm (n = 2).

3) *P. c. meeki* Rothschild, 1910. Bulletin of the British Ornithologists' Club 27: 35. Setekwa R. Dutch New Guinea. Like nominate in size and appearance but chin and sides of throat blackish and ♂ bill longer (near exclusively so, but sample small). MOPL 119 ± 10 mm (n = 4).

4) *P. c. chalcothorax* Stresemann, 1934. Onithologische Monatsberichte 42: 145. Doormanpaad, upper Mamderano (Idenburg R). Like nominate but upperparts with bright coppery sheen, underparts more coppery and long loral feathering less intense black, being slightly brownish. MWL of A♂ exclusively longer than the nominate, but samples small. Occipital plumes long, averaging 131 ± 4 mm (n = 2).

5) *P. c. chrysentera* Stresemann, 1934. Onithologische Monatsberichte 42: 147. Londberg, Sepik Mts. Traditionally said to differ from nominate by having the long black loral feathering with a coppery sheen (like eye ring but darker), but several specimens lack this character, their lores being pure black. MWL and MTL of A♂ longer than the nominate, but samples too small for meaningful comparisons. Occipital plumes long, averaging 131 ± 8 mm (n = 2).

6) *P. c. clelandiae* Gilliard, 1961. American Museum Novitates 2031: 5. Telefolmin 5000ft. (1524m), Victor Emanuel Mts, Mandated Territory of New Guinea. Like nominate but upperparts darker, more jet-black, less brown and on average larger, and A♂ bill slightly shorter, Occipital plumes long, averaging 126 ± 7 mm (n = 7).

Parotia lawesii Lawes' Parotia (Table 31)

A♀ slightly smaller than A♂, MWL and MWL by 5 & 14% respectively, MTL as a proportion of MWL 66 & 52% in A♂ and A♀ respectively. MTL and MTCL similar in length in birds of all ages and sexes. MTL of A♀ and I♂ 23 & 24% larger than A♂. Thus, ♂ tail length decreases in length slightly with age. MLL and MBL of A♀ are 7 & 2% shorter than in A♂ respectively, but as a proportion of MWL similar in both sexes and averages 31%. MBL proportionately similar in both sexes. MOPL of A♂ 162 ± 7 mm (n = 58). METL of A♂ longer (30 ± 4 mm, n = 32) than I♂ (14 ± 2 mm, n = 26) and A♀ (15 ± 1 mm, n = 37).

The subspecific biometrics do not help greatly as the characters do not vary much in size between the subspecies and the relative proportions of MTL, MLL and MBL to MWL are remarkably similar throughout.

1) *P. l. lawesii* Ramsay, 1885. Linnaean Society of New South Wales 10: 243. Astrolabe Mts. MOPL of A♂ 160 ± 5 mm (n = 21).

2) *P. l. heleneae* De Vis, 1897. Ibis p. 390. Neneba, upper Mambare R, north of Mt Scratches. Differs from nominate in A♂ forecrown being bronzed-brown, not silver-white, and in ♀ being slightly less red. All measurements of both sexes near-identical to nominate. MOPL of A♂ 161 ± 7 mm (n = 10). Originally described as a distinct species and subsequently long considered a subspecies of *P. lawesii* until Schodde & McKean (1973) and Cracraft (1992) resurrected it as a species. We concur with Gilliard (1969), Diamond (1972),

Beehler & Finch (1985), Beehler et al. (1986) and Coates (1990), however, in treating it as *P. I. heleneae*.

3) *P. I. fuscior* Greenway, 1934. Proceedings of the New England Zoological Club 14: 2. Mt Missim, Morobe district (Schodde & McKean, 1973; Cracraft, 1992). A♂ like nominate but ♀ said to be duller, less-chestnut brown above and with a darker head than *lawesi* (Gilliard, 1969), when there is in fact much variation within the species. Measurements are entirely compatible with those of nominate. MOPL of A♂ 169 ± 10mm (n = 7). We concur with Schodde & McKean (1973) and Cracraft (1992) that this subspecies is invalid and is a synonym of the nominate.

4) *P. I. exhibita* Iredale, 1948. Australian Zoologist 11: 162. Mt Hagen district. MOPL of A♂ 163 ± 7mm (n = 10). A♂ said to be like nominate but with darker sides to head and ventrally more uniformly barred (Gilliard, 1969) but variation within the species makes this diagnosis inadequate. Measurements are entirely compatible with those of nominate and, thus, it should be synonomised with it, in accord with Diamond (1972), Schodde & McKean (1973), Coates (1990) and Cracraft (1992).

Pteridiphora alberti King of Saxony Bird of Paradise (Table 32)

A♀ slightly smaller than A♂, MWL and MW by 9 & 11% respectively. MTL negligibly (2%) shorter in A♀, but as a proportion of MWL sexually dimorphic, 73% in A♀ and 68% in A♂. MTL of I♂ negligibly (2%) longer than in A♂. Thus, ♂ tail length decreases slightly with age. MLL of A♀ 5% shorter than in A♂, but as a proportion of MWL similar in both sexes. MBL similar in both sexes, but as a proportion of MWL negligibly (2%) longer in A♀. MOPL of A♂ 410 ± 42mm (n = 37). METL of A♀ & I♂ 17 ± 2mm (n = 46).

1) *P. a. alberti* Meyer, 1894. Bulletin of the British Ornithologists' Club 4: 11. 'Mountains on the Amerno R', but apparently from Weyland Mts.

2) *P. a. burgersi* Rothschild, 1931. Novitates Zoologicae 36: 253. Schraderberg, Sepik Mts. occipital plumes of A♂ notably larger than in the other two subspecies, MOPL 452 ± 43mm (n = 3), but sample small for meaningful comparison.

3) *P. a. hallstromi* Mayr & Gilliard, 1951. American Museum Novitates 1524: 12. Forests above Tomba, south slope of Mt Hagen, Central

Highlands, Mandated Territory of New Guinea. Birds have on average longer wings (4%, n = 68) and tail (5%; n = 69) than the two other subspecies, which are almost identical in size, (n = 76), but overlap in ranges of measurements is considerable.

We concur with comments of Gilliard & LeCroy (1968), Diamond (1972), Coates (1990) and Cracraft (1992) concerning the difficulties of adequately differentiating the supposed subspecies and therefore consider *P. alberti* a monotypic species.

Cicinnurus regius King Bird of Paradise (Table 33)

A♀ average the same size as A♂, their MWL being similar but MW 4% lighter. MTL of A♀ considerably longer (75%) than in A♂ and as a proportion of MWL 25% longer. MTL of I♂ similar to A♀. MTL 4 & 7% shorter than MTCL in A♀ and I♂ respectively, but 80% shorter in A♂. Thus, ♂ acquire progressively shorter outer tail rectrices with age, while simultaneously gaining a progressively grossly longer central pair. MBL and MLL and their proportion of MWL similar in both sexes.

Central rectrices of SA♂ show immense variation. Some ♀-plumaged birds, with only traces of A♂ plumage, had normal ♀-length central rectrices or far longer narrowly-pointed ones, often with slightly curved tips. In other SA♂, with a greater proportion of A♂ plumage, centrals were more wire-like with spatulate tips, which were slightly, half or distinctly curled. Some individuals even had two very different central rectrices: one long ♀-shaped one, which may or may be curved, and a much-longer wire-like spatulate-tipped one. Near-adult plumaged SA♂ often had one central retrice tipped with a fully coiled green disc and the other hardly coiled with no green.

The biometrics do not help systematic assessments as characters do not vary greatly in size between the subspecies, and the relative proportions of MTL, MLL and MBL to MWL are remarkably similar throughout the species. The systematic treatment of intraspecific variation has been the subject of recent debate. Six subspecies had been long established (Mayr 1941, 1962). Gilliard also (1969) maintained six subspecies but pointed out that they are all very similar.

1) *C. r. regius* (Linnaeus, 1758). Systema Naturae, ed. 10, p. 110. East Indies (= Aru Is - of Berlepsch 1911 Abhandlungen Senkenberg-

ischen Naturforschender Gesellschaft 34: 59). Only known from the Aru Is. MWL, MTL and MBL of A♂ and A♀ longest in this form, but there is considerable overlap in size ranges with other subspecies. A♂ central rectrices are also long, and in this respect are most like *rex* and *gymnorhynchus*.

2) *C. r. rex* (Scopoli, 1786). *Deliciae Florae et Faunae Insubricae* (Ticini) pt. 2, 88 (based on Sonnerat 1776, *Voyage Nouvelle Guineea*, p. 156, pl. 95). 'New Guinea' = Sorong District, Vogelkop. Now known from Misol and Salawati Is and New Guinea except between Geelvink Bay and the Huon Gulf. Frequently reported to occur on Batanta I but probably erroneously (Mees, 1982). Slightly smaller than the otherwise similar nominate in MWL, MTL and MBL. Most similar in size to *gymnorhynchus*.

3) *C. r. coccineifrons* Rothschild, 1896. *Novitates Zoologicae* 3: 10. Jobi I (= Yafen I). Only known from Yafen I. In most measurements similar to birds of adjacent mainland (*cryptorhynchus*). MBL smaller (8%) than the nominate, being most like *similis* and *cryptorhynchus*.

4) *C. r. similis* Stresemann, 1922. *Journal für Ornithologie* 70: 405. Stephansort, Astrolabe Bay. Occurs only from Astrolabe Bay and the upper Ramu R west to at least Humboldt Bay and upper Memberamo R. This form generally smaller than all other subspecies in MWL, MTL, MBL and MLL being most like, but slightly smaller than, *cryptorhynchus* in sizes. MTCL 11mm shorter than nominate.

5) *C. r. cryptorhynchus* Stresemann, 1922. *Journal für Ornithologie* 70: 405. Tawa, lower Mameramo R. Now known from eastern coast of Geelvink Bay and at north New Guinea near the Memberamo R mouth only. Most similar in sizes to *similis*. MTCL 6mm shorter than nominate.

6) *C. r. gymnorhynchus* Stresemann, 1922. *Journal für Ornithologie* 70: 405. Heldsbachktüste near Finschhafen. Now known from north-east coastal Huon Gulf. On average generally smaller and most similar in size to *rex* overall.

Although birds on the Aru Is. (*C. r. regius*) are on average slightly larger than birds of southern New Guinea (*C. r. rex*), variation is great and slight differences in plumage morphology are inadequate to justify an Aru Is subspecies (Mees, 1964; Cracraft, 1992). Gilliard (1969), Diamond (1972), Cooper & Forshaw (1977) and Cracraft (1992) also pointed out the weak morphological differentiation of most populations. Mees (1964, 1965, 1982) suggested that only two subspecies,

C. r. regius (including *rex* and *gymnorhynchus*) and *C. r. coccineifrons* (including *cryptorhynchus* and *similis*) be retained and that the roundish spot of green feathers above the eye of the former and the more elongate one in the latter be a 'tolerably constant character'.

More recently Cracraft (1992) recognised four subspecies (species in his view) but we find Cracraft's criteria inconsistent (e.g., he synonymises *gymnorhynchus* into *regius* stating it is 'nearly 100% diagnosably distinct' but retains three taxa of the *coccineifrons* group because he viewed them as 'nearly 100% diagnosable'). We do not find Cracraft's (1992) tentative plumage characters in support of retaining *cryptorhynchus* as distinct convincing. Furthermore all measurements of that population are entirely comparable with those of Yafen I. (*coccineifrons*) and northern New Guinea (*similis*) populations. In fact almost all measurements of the three populations, *coccineifrons*, *cryptorhynchus* and *similis*, are clinal from larger to slightly smaller, west to east. The more easterly population of *gymnorhynchus* does not fit this pattern, however, having a larger bill and therefore being more like birds of southern New Guinea (*C. r. regius*).

Thus, we feel Mees (1964) should be followed in combining these taxa into two subspecies *C. r. regius* and *C. r. coccineifrons*. By so doing, A♂ and A♀ of the two subspecies are almost identical in size, except in tail measurements. There still exists considerable overlap in size ranges of all parameters between the two subspecies, however. MWL of A♂ of the enlarged *C. r. regius* (including *rex* and *gymnorhynchus*) is a negligible 2% longer than the enlarged *C. r. coccineifrons* (including *cryptorhynchus* and *similis*) and MTL are the same. MTCL and MBL in A♂ *C. r. regius*, however, 6 & 7% longer respectively than in *C. r. coccineifrons*, and 5 & 2% larger as a proportion of respective MWL.

Cicinnurus magnificus Magnificent Bird of Paradise (Table 34)

A♀ average slightly smaller than A♂, MWL and MW by 4 and 15% respectively. MTL of A♀ considerably longer (51%) than in A♂ and as a proportion of MWL 20% longer. MTL of I♂ similar to A♀. MTL only 2 & 5% shorter than MTCL in A♀ and I♂ respectively, but 86% in A♂. Thus, ♂ acquire progressively shorter rectrices with age, while simultaneously gaining a progressively grossly longer central pair. MLL of A♀ 5% shorter than in A♂, but as a proportion

of MWL similar in both sexes. MBL similar in both sexes and as a proportion of MWL.

The central rectrices of SA♂ show great variation, relative to the degree of A♂ plumage acquired (as described for *C. regius*). The biometrics do not help much as the various characters vary little in size between the subspecies and the relative proportions of MTL, MLL, and MBL to MWL are remarkably similar throughout the species.

1) *C. m. magnificus* (Pennant, 1781). Specimen Faunulae Indicae, in Forster's Indian Zoology, p. 40 (based on Daubenton, Planches Enluminées, pl. 631). Arfak Mts, Vogelkop.

2) *C. m. chrysopterus* (Elliot, 1873). Monograph of the Birds of Paradise, p. 13. Jobi I (= Yapen I, Irian Jaya). In all measurements of both sexes *chrysopterus* almost identical to nominate, except for longer (9%) MTCL of A♂. Also differs from nominate in its secondary coverts and outer edges of flight feathers being more orange, less yellow, and the crown darker.

3) *C. m. hunsteini* (Meyer, 1885). Zeitschrift für die gesammte Ornithologie 2: 389, pl 21. Hufeisengebirge, southeastern New Guinea (= near Astrolabe Mts). Like nominate but paler on head and back (Gilliard, 1969), and orange on secondary coverts and outer edge of flight feathers brighter and deeper. All measurements of both sexes nearly identical to other subspecies, although the MWL in A♂ and A♀ slightly shorter by 3 & 4% respectively.

4) *C. m. intermedius* (Hartert, 1930). Novitates Zoologicae 36: 36. Snow Mts (= Upper Setakwa R, Irian Jaya). Like nominate but the scapulars and inner secondaries brighter, more dull orange than brown (Gilliard, 1969). In view of all measurements of both sexes of *intermedius* being extremely similar to *chrysopterus*, and of comments by Cracraft (1992), this subspecies should be synonomized with the former. MTCL of A♂, however, shorter (13%) than *chrysopterus*.

Cicinnurus respublica Wilson's Bird of Paradise (Table 35)

C. respublica (Bonaparte, 1850). Compte Rendu des séances de l'Academie des Sciences, Paris 30, 131-291. 'New Guinea', restricted to Waigeu I. Monotypic. A♀ average the same size or slightly smaller than A♂, MWL similar but MW 8% lighter. MTL of A♀ considerably longer (36%) than in A♂ and as a proportion of MWL 15% longer. MTL of I♂ similar to A♀. MTL and MTCL similar in A♀ and I♂, but in A♂ MTL

72% shorter than MTCL. Thus, ♂ acquire progressively shorter rectrices with age, while simultaneously gaining a progressively grossly longer central pair. MLL of A♀ negligibly (2%) shorter than in A♂, but as a proportion of MWL is similar in both sexes. MBL is similar in both sexes and as a proportion of MWL.

The central rectrices of SA♂ show great variation relative to the degree of A♂ plumage acquired (as described for *C. regius*).

Paradisaea raggiana Raggiana Bird of Paradise (Table 36)

A♀ smaller than A♂, MWL and MW by 13 & 36% respectively. MTL of A♀ also shorter (11%) than A♂, but as a proportion of MWL negligibly (2%) longer. MTL of A♀ and I♂ 7% longer than MTCL, but in A♂ 71% shorter. ♂ do not acquire significantly longer outer rectrices with age, I♂ only 4% shorter than A♂, but do gain a progressively grossly longer central pair. MLL of A♀ 11% shorter than in A♂, but as a proportion of MWL similar in both sexes. MBL of A♀ 4% shorter, but as a proportion of MWL negligibly (2%) longer. MFPL of A♂ averages 214 ± 57 mm (n = 96).

The central rectrices of SA♂ of all *Paradisaea* species show immense variation. Some ♀-plumaged ♂, with only traces of adult plumage, have normal-length ♀-like central rectrices or far longer narrow and pointed ones, often slightly curved at their tips. Other SA♂, showing a greater degree of A♂ plumage, have thin long feathery central rectrices, often with feathery spatulate tips, or adult-like wires with spatulate tips.

The systematics of this species has been somewhat confused as it was long thought to represent a subspecies of the Greater Bird of Paradise, *Paradisaea apoda*. The establishment of common names for what earlier ornithologists considered species, but are now considered subspecies of *P. raggiana*, compounded the confusion. With respect to the (nominal) species, the mean measurements are so similar overall as to be of little diagnostic use, particularly as samples of the non-nominate are small. Variation in plumage markings and colouration is far more helpful.

1) *P. r. raggiana* Sclater, 1873. Proceedings of the Zoological Society of London, p. 559. Orangerie Bay. Now known from south-eastern New Guinea (Orangerie Bay to Milne Bay). The fore-back is yellow, fading as it overlays sepia of the mantle. Flank plumes of A♂ scarlet, MFPL

258 ± 74 mm ($n = 8$). The average tail length of 15cm by Cooper & Forshaw (1977) for the nominate form is excessively long.

2) *P. r. augustaevictoriae* Cabanis, 1888. *Journal für Ornithologie* 36: 119. 'Kaiser Wilhelm's Land', restricted to Finschhafen. Now known from the coast of Huon Gulf, the Markham R, and the headwaters of the Ramu R (at the Uria R). This subspecies averages overall c. 4% smaller than nominate, but there is considerable overlap in size ranges. Flank plumes of $A\delta$ orange, MFPL 204 ± 51 mm ($n = 33$), and c. 20% shorter than in nominate. Like *intermedia* but flank plumes orange, abdomen/belly paler, and yellow throat collar narrow.

3) *P. r. intermedia* De Vis, 1894. Annual Report on British New Guinea, 1893-94, p. 105. Kumusi R. Now known from Collingwood Bay to Holnicote Bay, Kumusi R, and the lower Mambare R. Like *salvadorii* but both sexes with yellow mantle/back and yellow streaking down to upper tail coverts. MWL and MTL of $A\delta$ shorter than nominate and most like *augustaevictoriae* in size. Flank plumes of $A\delta$ scarlet and long, MFPL 239 ± 44 mm ($n = 18$).

4) *P. r. granti* North, 1906. Victorian Naturalist 22: 156. 'German New Guinea'. Exact range unknown but somewhere between the Mambare R and Salamaua (= Morobe area). An examination of the majority of pertinent specimens proved confusing owing to considerable variation and lack of localities. Given the now better-defined southeastern-most distribution of *augustaevictoriae* and the northwestern-most *intermedia*, we concur entirely with Rothschild (1930) and Mayr (1941, 1962) that *granti* is a changing, intergrading, population between the two (*contra* Cracraft, 1992). Only four $A\delta$ measured as many specimens lack a location. MWL, MTL, MTCL, MLL, MBL and MBW 187, 131, 457, 40.4, 37.1 & 10.6mm respectively. Flank plumes of $A\delta$ vary between the scarlet of *intermedia* and orange of *augustaevictoriae*, MFPL 238 ± 47 mm (these biometric data are excluded from Table 36).

5) *P. r. salvadorii* Mayr & Rand, 1935. American Museum Novitates 814: 11. Vanumai, Central Division, Papua, south-east New Guinea. Now known from south New Guinea from near the Papuan-West Irian border (Tarara), upper Fly and Purari valley (including the Wahgi). Like nominate but sepia mantle of both sexes lacking yellow, and scarlet of flank plumes less deep. Cracraft (1992) found evidence of clinal variation in characters of *salvadorii*. Similar in mean mea-

surements to nominate, but MTCL of $A\delta$ 16mm longer and MFPL slightly shorter (201 ± 58 mm, $n = 37$). The subspecies may be invalid. Further studies are required.

Paradisaea apoda Greater Bird of Paradise
(Table 37)

$A\delta$ smaller than $A\varnothing$, MWL by 17%. Few weights available for this widely known species and none for adults. MTL of $A\varnothing$ also shorter (14%) than $A\delta$, but as a proportion of MWL slightly (3%) longer. MTL similar to MTCL in δ , but 6% longer in $A\varnothing$ and 75% shorter in $A\delta$. δ do not acquire longer outer rectrices with age, δ only 9% shorter than $A\delta$, but gain a progressively grossly longer central pair. MLL of $A\varnothing$ 13% shorter than in $A\delta$, but as a proportion of MWL similar in both sexes. MBL of $A\varnothing$ also 5% shorter, but as a proportion of MWL 3% longer. MFPL 196 ± 56 mm ($n = 31$).

Central tail rectrices of $SA\delta$ show great variation, as in *P. raggiana*.

Gilliard's (1969) average $A\delta$ tarsal length of 57mm for the species is presumably erroneous as it is exclusively longer than ours, and Cooper & Forshaw's (1977) tarsal lengths for nominate are extremely long, being exclusively longer than ours for $A\varnothing$.

Considerable confusion exists in the synonymy of this species and that of *P. raggiana* because the latter was long treated as a subspecies of *P. apoda*. The considerable differences in size, ♀ plumage and head, and back and flank plume markings and colouration in $A\delta$ leave few doubts that the present treatment is correct, particularly as *P. apoda* does not intergrade with *P. raggiana*, but merely produces odd hybrid individuals where they meet. Two subspecies of *P. apoda* have long been established and widely accepted, but Cracraft (1992) suggested that the two forms are not diagnostically distinct with respect to the supposed paler and more maroon upper breast of *P. a. novaeguinea*. He apparently did not take the clearly different sizes of the two populations into account, the mainland birds being much smaller than those of the Aru Is. with no or little overlap in size (LeCroy, 1981). We accept both subspecies.

1) *P. a. apoda* Linnaeus, 1758. *Systema Naturae*, ed. 10, 1: 110, 'India' (= Aru Is, Irian Jaya). Only known from the Aru Is. MFPL of $A\delta$ 210 ± 7 mm ($n = 14$).

2) *P. a. novaeguinea* D'Albertis & Salvadori, 1879. *Annals Museo Civico Genova* 14: 96. Mid-

dle Fly R (300-450 miles upstream). This mainland subspecies has been long accepted on the basis of resembling the nominate but with the upper breast paler and more maroon and being smaller. MWL and MTL of A♂ and A♀ 11 & 14% and 12 & 16% shorter than nominate respectively. MLL and MBL of A♂ and A♀ also less, by 11 & 16% and 8 & 9% respectively. Moreover, MWL of A♀ as a percentage of A♂ in the nominate is 88% and MTL 93%, whereas in *A. novaeguinea* the respective proportions are 85 & 88%. MFPL of A♂ 185 ± 40mm (n = 18).

Craerat (1992) considered supposed plumage characters not diagnosably distinct. We found mainland A♀ to be (almost exclusively) smaller than nominate A♀ in wing and tail length and to average a good deal smaller than the allopatric island nominate population in other measurements. We therefore retain the subspecies *novaeguinea*.

Paradisaea minor Lesser Bird of Paradise (Table 38)

A♀ smaller than A♂, MWL and MW by 15 & 35% respectively. MTL of A♀ also shorter (12%) than in A♂, but as a proportion of MWL negligibly (2%) longer. MTL of A♀ and I♂ 8 and 5% longer than MTCL respectively, but in A♂ 73% shorter. ♂ do not acquire significantly longer outer rectrices with age. I♂ only 4% shorter than A♂, but gain a progressively grossly longer central pair. MLL of A♀ 11% shorter than in A♂, but as a proportion of MWL similar in both sexes. MBL of A♀ 4% shorter, but as a proportion of MWL 3% longer. MFPL 216 ± 53mm (n = 59).

Central rectrices of SA♂ show immense variation, as in *P. raggiana*.

Four allopatric subspecies have been widely accepted (Mayr, 1941; Gilliard 1969). Mean measurements are so similar overall for the subspecies *minor*, *pulchra* and *finschi* as to be of little diagnostic use. Variation in plumage and colouration is far more helpful.

1) *P. m. minor* Shaw, 1809. General Zoology - Aves, 7, pt. 2, p. 486 'New Guinea', restricted to Dorey, Vogelkop. Now known from west New Guinea eastward in the north to Humboldt Bay and in the south to Etna Bay. MFPL of A♂ 215 ± 60mm (n = 23).

2) *P. m. finschi* Meyer, 1885. Zeitschrift für die gesammte Ornithologie 2, 383. Karan, between Aitape and the mouth of the Sepik, at longitude 142°30'E. Now known from northern New Guinea from the Aitape region and Sepik Valley eastward

to Astrolabe Bay and the Upper Ramu R. Yellow shoulder marking less extensive than in other subspecies. On average similarly sized to nominate but flank plumes brighter orange-yellow and MFPL slightly shorter (203 ± 40mm, n = 25).

3) *P. m. jobiensis* Rothschild, 1897. Bulletin of the British Ornithologists' Club 6, 46. Jobi I (= Yapen I). Only known from Yapen I. Generally larger than nominate, MWL, MTL and MLL of A♂ 6, 8 & 8% longer respectively. Flank plume colour as nominate and MFPL slightly longer (250 ± 55mm, n = 11).

4) *P. m. pulchra* Mayr & de Schauensee, 1939. Proceedings of the Academy of Natural Sciences of Philadelphia 91: 151. Tip, Misol I. Only known from Misol I. Like nominate but brown of plumage said to be more purplish, less reddish (Gilliard, 1969). MWL, MTL and MLL of A♂ very slightly larger than nominate, but samples too small for meaningful comparisons, and there is considerable overlap in all size ranges between the two forms.

The availability of 11 specimens from Misol I allowed Mees (1965) to re-assess the validity of *P. m. pulchra*, originally described from only two birds (Mayr & de Schauensee, 1939). Mees concluded that Misol I birds did not differ consistently from birds of the adjacent mainland (*P. m. minor*). LeCroy (1981) subsequently presented measurements suggesting that, while Misol I birds are a little larger than adjacent mainland birds, there is considerable overlap. Our measurements show far less difference in size between the two forms, birds of Misol I being no larger than those of the Vogelkop and certainly not even close to 'large as in *jobiensis*' (Gilliard, 1969). In any event it appears that this subspecies should be synonymised with *minor*.

Paradisaea decora Goldie's Bird of Paradise (Table 39)

Paradisea decora Salvin & Godman, 1883. Ibis 1883, p. 131. Fergusson I. Only known from D'Entrecasteaux Archipelago (Fergusson and Normanby Is.). Monotypic. A♀ slightly smaller than A♂, MWL by 11%, but only one A♂ MW known. MTL of A♀ also shorter (7%) than A♂, but as a proportion of MWL 4% longer. MTL of A♀ and I♂ 17 & 15% longer than MTCL respectively, but in A♂ they are 68% shorter. ♂ do not acquire longer outer rectrices with age, those of I♂ similar to A♂, but gain a progressively grossly longer central pair. MLL of A♀ 10% shorter than in A♂ but as a proportion of MWL similar in both

sexes. MBL of A♀ negligibly (2%) shorter but as a proportion of MWL negligibly (2%) longer. MFPL of A♂ 203 ± 42 mm ($n = 14$).

Central tail rectrices of SA♂ show great variation, as in *P. raggiana*.

Paradisaea rubra Red Bird of Paradise
(Table 40)

Paradisaea rubra Daudin, 1800. *Traité d'Ornithologie* (Lesson). 2: 271. 'New Guinea' in error for Waigeu I. Monotypic. A♀ slightly smaller than A♂, MWL and MW by 10 & 21% respectively. MTL of A♀ also shorter (4%) than A♂, but as a proportion of MWL 4% longer. MTL similar to MTCL in I♂, but 8% longer in A♀ and 79% shorter in A♂. ♂ do not acquire longer outer rectrices with age, I♂ as A♂, but gain a progressively grossly longer central pair. MLL of A♀ 7% shorter than in A♂, but as a proportion of MWL similar in both sexes. MBL of A♀ also 3% shorter, but as a proportion of MWL only negligibly (2%) longer. MFPL 94 ± 15 mm ($n = 21$).

Central tail rectrices of SA♂ show immense variation, as in *P. raggiana*.

Paradisaea guilielmi Emperor Bird of Paradise (Table 41)

Paradisaea guilielmi Cabanis, 1888. *Journal für Ornithologie* 36: 119. 'Kaiser Wilhelm's Land' (restricted to the Sattelberg, Huon Peninsula, PNG). Monotypic. A♀ smaller than A♂, MWL by 11% smaller, but no weights available for comparisons. MTL of A♀ also shorter (7%) than in A♂, but as a proportion of MWL slightly (3%) longer. MTL of A♀ and I♂ very slightly (2 & 3%) longer than MTCL respectively, but in A♂ 80% shorter. ♂ acquire a progressively grossly longer central pair with slightly shorter (3%) outer rectrices but our samples of I♂ too small for meaningful comparisons. MLL of A♀ 9% shorter than in A♂, but as a proportion of MWL similar in both sexes. MBL of A♀ negligibly (2%) shorter, but as a proportion of MWL slightly (2%) longer. MFPL of A♂ 77 ± 38 mm ($n = 20$).

Paradisaea rudolphi Blue Bird of Paradise
(Table 42)

A♀ smaller than A♂, MWL and MW by 5 & 13% respectively. MTL of A♀ 13% longer than in A♂ and as a proportion of MWL 10% longer. MTL of A♀ and I♂ similar to MTCL, unlike congeners, but in A♂ 80% shorter. ♂ acquire shorter outer tail rectrices with age, I♂ 16%

longer than A♂, while simultaneously gaining a progressively longer central pair, contrary to congeners, with the possible exception of *P. guilielmi*. MLL and MBL of A♀ 4 & 2% shorter than in A♂, but as a proportion of MWL similar in both sexes. MFPL 88 ± 16 mm ($n = 26$).

Central rectrices of SA♂ show great variation, as in *P. raggiana*.

Three subspecies are recognised. Mean measurements are so similar overall as to be of little diagnostic use and samples for two subspecies (*ampla* and *margaritae*) are small. Variation in plumage markings and colouration are more helpful.

1) *P. r. rudolphi* (Finsch, 1885). *Zeitschrift für die gesammte Ornithologie* 2: 385, pl. 20. Hufisengebirge, south-east New Guinea. MFPL of A♂ 84 ± 13 mm ($n = 17$).

2) *P. r. ampla* Greenway, 1934. *Proceedings of the New England Zoological Club* 14: 1. Mt Missim, Morobe district. Similar to nominate but head lighter, more brownish, less blackish in A♂ (Gilliard, 1969). Some measurements of *ampla* are on average only slightly smaller than nominate but with much overlap. MFPL of A♂ 90 ± 25 mm ($n = 3$). In view of comments by Gilliard (1969), Cooper & Forshaw (1977) and Cracraft (1992) regarding the questionable validity of *P. r. ampla*, it seems that merging this subspecies into nominate *P. r. rudolphi* is overdue.

3) *P. r. margaritae* Mayr & Gilliard, 1951. *American Museum Novitates* 1524: 11. Kimil R, 20 miles west-northwest of Nondugl, Wahgi Valley, Central Highlands, Mandated Territory of New Guinea. Like nominate but ♀ with underparts uniformly and narrowly barred blackish. MTL and MLL of A♂ and A♀ on average shorter than in the nominate, but samples too small for meaningful conclusions. MFPL 101 ± 10.3 mm ($n = 4$). Only one or two birds of the Tari Valley area have been collected, and it is not known to which subspecies they should be allocated. We did not examine them.

PARADISAEA SPECIES. We found our figures for the various *Paradisaea* taxa in close agreement with those of Leeroy (1981), considering the often gross differences in sample sizes. We cannot compare our 'total bill length' with 'exposed bill length' (see Methods). Small differences in measuring techniques between ourselves and LeCroy (1981) are reflected by negligibly to slightly longer tail lengths and slightly (2-5mm) larger tarsus measurements than ours. In calculating the MTL as a proportion of MWL, these differences might, therefore, become significant.

Differences between LeCroy's measurements of 'unplumed males' and ours for 'immature males' suggest that the former may have included males with signs of A ♂ plumage, other than flank plumes. Our 'immature males' class included only ♀-plumaged birds showing absolutely no sign of ♂ plumage.

SYSTEMATIC CONCLUSIONS

The following systematic list includes taxa accepted by the above review. Genera and their sequence are those of Beehler & Finch (1985), with the addition of those taxa extrazonal to New Guinea. Species and subspecies, the latter presented chronologically, are those of Gilliard (1969); those marked with an asterisk have been described since Gilliard (1969). Names in parenthesis are those of subspecies included in Gilliard (1969) that were invalid (*L. s. pseudoparotia*) or are not accepted herein. For consistency herein and ease of reference with that work only spelling of genus and specific names are as in Gilliard (1969). It should be noted, however, that a few of these have been subsequently corrected.

PARADISAEIDAE

CNEMOPHILINAE

Cnemophilus:

C. m. macgregorii, *C. m. (kuboriensis)* *sanguineus*, *C. l. loriae*, *C. l. arietystina*, *C. l. inexpectata*

Loboparadisea:

L. s. sericea, *L. s. aurora*

PARADISAEINAE

Macgregoria:

M. p. pulchra, *M. p. caroliniae*

Lycocorax:

L. p. pyrrhopterus, *L. p. morotensis*, *L. p. obiensis*

Manucodia:

M. a. ater, *M. a. alter*, *M. a. subalter*, *M. chalybata*, *M. c. comrii*, *M. c. nobriandi*, *M. (rubieensis) jobiensis*, *M. k. keraudrenii*, *M. k. gouldi*, *M. k. jamesii*, *M. k. hunsteini*, *M. k. (meyeri) purpureoviolaceus*, *M. k. neumannii*, *M. k. adelberti*, *M. k. aruensis**, *M. k. diamondsi**

Paraligalla:

P. (intermedia) carinulata, *P. brevicanula*

Ptiloris:

P. paradiseus, *P. victoriae*, *P. m. magnificus*, *P. m. intercedens*, *P. m. alberti*

Semioptera:

S. w. wallacei, *S. w. halinaherae*

Seleucidis:

S. m. melanoleuca, *S. m. auripennis*

Epimachus:

E. a. (geisleri, inversus) albertisi, *E. a. cervinicauda*, *E. brunii*, *E. f. fastiosus*, *E. f. (stresenanni) atratus*, *E. f. ultimus**, *E. m. meyeri*, *E. m. (megarhynchus) albicauda*, *E. m. bloodi*

Astrapia:

A. nigra, *A. s. splendidissima*, *A. s. (elliotisimithi) helios*, *A. mayeri*, *A. s. stephaniae*, *A. s. (ducalis) feminina*, *A. rothschildi*

Lophorina:

L. s. superba, *L. s. niedda*, *L. s. (sphinx) minor*, (*L. s. pseudoparotia*), *L. s. (conectens, addenda) latipennis*, *L. s. feminina*

Parotia:

P. wahnesi, *P. sefilata*, *P. c. carolae*, *P. c. berlepschi*, *P. c. meeki*, *P. c. chalcothorax*, *P. c. chrysenia*, *P. c. clelandiae*, *P. l. (fuscior; exhibita) lawesii*, *P. l. heleneae*

Pteridophora:

P. (burgersi, hallstromi) alberti

Cicinnurus:

C. r. (rex, gymnorhynchus) regius, *C. r. (similis, cryptorhynchus) coeruleifrons*, *C. m. magnificus*, *C. m. (intermedius) chrysopterus*, *C. m. hunsteini*, *C. respublica*

Paradisaea:

P. r. raggiana, *P. r. augustaevictoriae*, *P. r. intermedia*, (*P. r. granti*), *P. r. salvatori*, *P. a. apuana*, *P. a. novaequeenia*, *P. m. (pulchra) minor*, *P. m. finschi*, *P. m. jobiensis*, *P. decora*, *P. rubra*, *P. guilielmi*, *P. r. (ampla) rudolphi*, *P. r. margaritae*

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APPENDIX 1

TABLE 1. Measurements (mm) and weights (g) of specimens of *Cnemophilus macgregorii*

	Wing length	Tail length	Tarsus length	Total head length	Bill length	Bill width	Weight	
<i>C. m. macgregorii</i>								
Males: adult								
Mean	113	92	40.8	54.9	29.1	5.7	98	
SD	2.26	2.48	1.82	1.49	1.55	0.37	4.51	
Min	107	86	37.8	53.2	24.1	4.9	94	
Max	117	96	45.8	59.1	32.0	6.5	104	
n	22	22	23	17	24	21	4	
subadult								
Mean	112	92	40.8	54.4	30.4	5.8		
SD	3.00	2.99	1.77	1.05	0.44	0.49		
Min	107	88	39.3	53.3	29.7	5.3		
Max	115	95	43.1	55.4	30.7	6.4		
n	5	4	5	3	4	4		
immature								
Mean	111	94	40.7	53.2	29.8	5.5	81	
SD	2.94	4.30	0.67	1.15	1.33	0.36		
Min	107	91	39.8	51.9	27.9	5.0		
Max	116	103	41.8	54.1	31.3	5.9		
n	7	7	7	3	6	7	1	
Females: adult								
Mean	108	93	39.3	52.1	27.1	5.6	91	
SD	3.44	4.37	2.25	0.91	1.41	0.44		
Min	104	89	35.7	50.9	25.0	5.0		
Max	114	101	42.6	53.3	29.4	6.3		
n	10	9	9	7	10	10	1	
<i>C. m. sanguineus</i>								
Males: adult								
Mean	115	91	41.2	52.8	28.3	5.7	105	
SD	2.43	2.58	1.46	0.25	1.13	0.47	11.56	
Min	110	86	38.0	52.6	25.8	4.8	94	
Max	118	96	44.3	53.1	30.0	6.4	120	
n	26	25	26	3	22	24	5	
subadult								
Mean	115	89	42.0	53.3	29.1	5.9	86	
SD	2.35	3.76	1.95	0.14	0.89	0.35		
Min	112	84	38.3	53.2	27.7	5.3		
Max	118	94	43.8	53.4	30.1	6.3		
n	6	6	6	2	6	6	1	
immature								
Mean	114	90	41.6	52.7	27.7	5.6	87	
SD	2.56	2.79	1.40	0.99	1.11	0.47		
<i>C. m. kubariensis</i>								
Males: adult								
Mean	112	88	41.6			29.6	5.3	94
SD	0.96	0.96	0.92			1.36	0.26	
Min	111	87	40.6			28.0	5.0	
Max	113	89	42.7			30.9	5.6	
n	4	4	4			4	4	1
immature								
Mean	112	87	39.5			27.2	5.6	97
n	1	1	1			1	1	1
Females: adult								
Mean	109	83	39.0			25.6	5.2	
SD	2.83	2.83	0.49			0.00	0.14	
Min	107	81	38.6			25.6	5.1	
Max	111	85	39.3			25.6	5.3	
n	2	2	2			2	2	
<i>alt subspecies</i>								
Males: adult								
Mean	114	91	41.1	54.7	28.8	5.7	100	
SD	2.59	2.67	1.62	1.64	1.40	0.43	9.37	
Min	107	86	37.8	52.6	24.1	4.8	90	
Max	118	96	45.8	59.1	32.0	6.5	120	
n	53	52	54	21	51	50	11	
subadult								
Mean	113	90	41.4	54.0	29.6	5.8	86	
SD	2.84	3.66	1.88	0.96	0.95	0.39		
Min	107	84	38.3	53.2	27.7	5.3		
Max	118	95	43.8	55.4	30.7	6.4		
n	11	10	11	5	10	10	1	
immature								
Mean	113	91	41.2	53.0	28.2	5.6	88	
SD	2.90	3.79	1.29	0.99	1.48	0.42	8.08	
Min	107	87	38.9	51.9	26.0	5.0	81	
Max	119	103	43.3	54.1	31.3	6.6	97	
n	24	23	24	5	23	24	3	
Females: adult								
Mean	110	90	39.9	51.6	26.3	5.6	93	
SD	3.68	4.50	1.74	1.30	1.49	0.36	11.77	
Min	101	80	35.7	49.7	23.0	4.8	79	
Max	115	101	42.7	53.3	29.4	6.4	125	
n	34	33	33	9	33	34	11	

TABLE 2. Measurements (mm) and weights (g) of specimens of *Cnemophilus loriae*

	Wing length	Tail length	Tarsus length	Total head length	Bill length	Bill width	Weight

	<i>C. l. loriae</i>						
Males: adult							
Mean	103	75	37.3	53.3	26.6	6.5	83
SD	2.15	2.55	1.60	1.39	1.37	0.37	7.41
Min	99	71	34.3	51.1	21.4	5.6	76
Max	107	81	42	55.5	29.4	7.4	94
n	29	29	28	15	29	28	7
subadult							
Mean	100	74	36	52.8	25.8	6.4	
n	1	1	1		1	1	
immature							
Mean	102	77	37.0	51.2	25.8	6.2	89
SD	1.20	2.93	1.25	0.71	1.48	0.22	9.85
Min	101	71	35.2	50.5	22.4	6	81
Max	104	81	38.3	52.1	27.2	6.6	100
n	9	9	9	4	9	9	3
Females: adult							
Mean	102	77	36.6	51.5	26.1	6.4	86
SD	2.39	3.71	1.56	0.97	0.82	0.40	6.21
Min	98	72	34.2	49.6	24.3	5.7	78
Max	106	84	40.4	53.4	27.5	7.1	96
n	18	18	18	12	18	18	8

	<i>C. l. amethystina</i>						
Males: adult							
Mean	105	77	37.0	52.5	26.1	6.3	93
SD	2.14	2.08	1.49	1.13	0.65	0.34	8.95
Min	101	73	32.3	50.7	24.7	5.6	80
Max	109	81	39.1	53.8	27.5	6.8	101
n	25	25	25	7	25	25	5
subadult							
Mean	106	80	37.2	53.3	26.5	6.3	98
SD	1.98	3.11	0.89	1.87	0.84	0.36	
Min	102	75	35.9	51.3	24.9	5.7	
Max	108	85	38.7	55	27.9	6.9	
n	12	13	13	3	13	13	1
immature							
Mean	103	80	36.9	53.2	26.4	6.5	82
SD	2.52	2.73	1.11	0.57	0.69	0.43	14.61
Min	100	75	34.8	52.5	24.9	5.7	66
Max	107	86	38.9	54.1	27.6	7.3	100
n	14	14	14	7	13	14	6
Females: adult							
Mean	103	80	36.9	51.5	25.9	6.3	78.6
SD	2.94	3.67	1.49	1.37	0.76	0.35	11.18
Min	98	73	34	49.6	24.3	6	69
Max	109	88	39.9	53.8	27.2	7.2	95
n	20	20	20	7	19	20	7

	<i>C. l. inexpectata</i>						
Males: adult							
Mean	103	71	37.5	52.6	26.4	6.2	79
SD	2.72	2.61	1.40	0.97	0.93	0.31	4.35
Min	97	66	34.7	51.1	25.2	5.5	75
Max	107	77	40.0	53.8	28.7	6.7	85
n	25	25	24	6	24	24	4
subadult							
Mean	103	71	37.3	52.9	26.2	6.4	
SD	2.66	2.78	0.97	0.00	0.81	0.23	
Min	99	66	36.4	52.9	25.3	6	
Max	107	76	38.9	52.9	27.6	6.8	
n	8	8	8	3	8	8	
immature							
Mean	104	76	38.3	53.0	27.0	6.1	87
SD	3.04	3.25	0.73	0.95	0.93	0.47	

Min	100	70	36.9	52.2	25.1	5.2	
Max	109	81	39.2	54.6	28.3	7	
n	13	13	12	5	13	13	1
Females: adult							
Mean	102	73	36.4	51.3	26.0	6.3	80
SD	2.34	2.63	1.17	0.92	0.92	0.42	10.47
Min	97	69	34.4	49.7	24.0	5.1	60
Max	108	79	38.6	52.5	28.0	7.2	95
n	27	28	28	10	28	28	8

	all subspecies						
Males: adult							
Mean	104	74	37.3	53.0	26.4	6.3	85
SD	2.44	3.53	1.50	1.27	1.05	0.37	9.08
Min	97	66	32.3	50.7	21.4	5.5	75
Max	109	81	42	55.5	29.4	7.4	101
n	79	79	77	28	78	77	16
subadult							
Mean	104	76	37.2	53.1	26.4	6.3	98
SD	2.64	5.39	0.91	1.20	0.81	0.31	
Min	99	66	35.9	51.3	24.9	5.7	
Max	108	85	38.9	55.0	27.9	6.9	
n	21	22	22	6	22	22	1
immature							
Mean	103	78	37.4	52.6	26.5	6.3	85
SD	2.53	3.48	1.21	1.09	1.10	0.42	12.27
Min	100	70	34.8	50.5	22.4	5.2	66
Max	109	86	39.2	54.6	28.3	7.3	100
n	36	36	35	16	35	36	10
Females: adult							
Mean	103	76	36.6	51.4	26.0	6.3	81
SD	2.56	4.40	1.37	1.03	0.84	0.39	9.55
Min	97	69	34	49.6	24.0	5.1	60
Max	109	88.1	40.4	53.8	28.0	7.2	96
n	65	66	66	29	65	66	23

TABLE 3. Measurements (mm) and weights (g) of specimens of *Loboparadisea sericea*

	Wing length	Tail length	Tarsus length	Total head length	Bill length	Bill width	Weight
<i>L. s. sericea</i>							
Males: adult							
Mean	94	55	31.1	44.6	20.4	6.1	72
SD	2.32	2.42	1.08	1.00	1.04	0.56	0.21
Min	90	52	28.8	43.2	18.8	5.2	72
Max	98	59	33.5	46.5	23.0	7.2	72
n	17	16	16	9	16	15	2
immature							
Mean	97	60	31.8	43.6	20.4	6.3	62.7
SD	1.15	4.32	0.83		0.70	0.19	
Min	96	56	30.7		19.8	6	
Max	98	66	32.7		21.4	6.4	
n	3	4	4	1	4	4	1
Females: adult							
Mean	98	58	31.9	47.2	21.4	7.1	
SD	1.83	2.71	0.83	0.07	0.58	0.49	
Min	96	55	31	47.1	20.8	6.5	
Max	101	63	33.3	47.2	22.2	7.6	
n	6	6	6	2	6	4	
immature							
Mean	97	60	31.4	45.7	20.5	6.5	76
SD	2.27	1.96	0.79	0.46	0.46	0.30	1.56
Min	92	56	30.4	45.4	19.7	6.1	75
Max	99	63	32.6	46.2	21.4	6.9	77
n	10	10	10	3	9	9	2

L. s. aurora

Males: adult							
Mean	97	59	31.3	45.5	21.2	6.5	62
SD	1.91	1.45	0.91	1.08	1.01	0.40	8.87
Min	93	56	29.4	43.2	19.8	5.8	50
Max	100	61	32.6	47.2	24.2	7.3	75
n	16	16	16	11	16	14	12
immature							
Mean	96	63	30.6	46.1	21.4	6.2	70
SD	0.71	1.63	2.19	0.28	0.28	0.07	5.20
Min	95	62	29.0	45.9	21.2	6.1	63
Max	96	64	32.1	46.3	21.6	6.2	75
n	2	2	2	2	2	2	4
Females: adult							
Mean	97	63	30.9	47.0	22.7	6.6	73
SD	5.13	0.61	1.51	0.55	0.60	0.21	2.83
Min	91	62	29.8	46.5	22.1	6.4	71
Max	101	63	32.6	47.6	23.3	6.8	75
n	3	3	3	3	3	3	2
immature							
Mean	99	63	31.8	46.2	21.3	7.2	70
SD	3.24	3.37	0.88	1.44	0.53	0.28	8.81
Min	93	59	30.3	43.6	20.2	6.7	60
Max	102	69	32.8	47.8	21.6	7.6	77
n	7	7	7	6	7	7	3
all subspecies							
Males: adult							
Mean	95	57	31.2	45.1	20.8	6.3	64
SD	2.68	2.74	0.98	1.11	1.09	0.51	8.94
Min	90	52	28.8	43.2	18.8	5.2	50
Max	100	61	33.5	47.2	24.2	7.3	75
n	33	32	32	20	32	29	14
immature							
Mean	96	61	31.4	45.3	20.7	6.2	68
SD	1.10	3.79	1.34	1.46	0.77	0.16	5.43
Min	95	56	29.0	43.6	19.8	6.0	63
Max	98	66	32.7	46.3	21.6	6.4	75
n	5	6	6	3	6	6	5
Females: adult							
Mean	97	59	31.5	47.1	21.8	6.9	73
SD	3.00	3.26	1.11	0.40	0.85	0.43	2.83
Min	91	55	29.8	46.5	20.8	6.4	71
Max	101	63	33.3	47.6	23.3	7.6	75
n	9	9	9	5	9	7	2
immature							
Mean	98	61	31.6	46.0	20.9	6.8	72
SD	2.94	3.23	0.82	1.19	0.60	0.44	7.10
Min	92	56	30.3	43.6	19.7	6.1	60
Max	102	69	32.8	47.8	21.6	7.6	77
n	17	17	17	9	16	16	5

TABLE 4 Measurements (mm) and weights (g) of specimens of *Macgregoria pulchra*

	Wing length	Tail length	Tarsus length	Total head length	Bill length	Bill width	Weight
<i>M. p. pulchra</i>							
Males: adult							
Mean	202	161	61.3	70.0	39.4	6.1	256
SD	5.78	3.15	2.24	2.65	1.57	0.26	13.37
Min	187	156	54.6	65.8	36.9	5.5	242
Max	211	168	64.6	74.5	42.4	6.5	274
n	19	18	19	10	18	18	6
Females: adult							
Mean	183	147	56.1	68.5	37.8	5.9	198
SD	4.35	3.06	0.92	2.22	0.29	8.62	
Min	175	143	55.1	35.0	5.6	190	
Max	187	152	57.7	41.7	6.4	207	
n	7	7	6	1	7	7	3
<i>M. p. caroliniae</i>							
Males: adult							
Mean	192	134	64.4	73.7	41.6	6.0	349
SD	5.27	3.95	1.27	2.05	2.14	0.23	12.02
Min	184	128	62.0	70.8	37.3	5.4	340
Max	200	141	65.9	76.5	44.0	6.1	357
n	10	10	10	5	10	8	2
Females: adult							
Mean	172	124	58.3	68.2	37.8	5.6	230
SD	4.13	4.63	2.78	1.18	1.67	0.29	
Min	164	120	52.9	66.3	35.6	5	
Max	179	133	61.3	69.3	40.3	6	
n	10	10	10	5	10	10	1
all subspecies							
Males: adult							
Mean	199	151	62.4	71.2	40.2	6.1	279
SD	7.28	13.61	2.46	3.01	2.06	0.26	44.52
Min	184	128	54.6	65.8	36.9	5.4	242
Max	211	168	65.9	76.5	44.0	6.5	357
n	29	28	29	15	28	26	8
Females: adult							
Mean	177	134	57.4	68.2	37.8	5.7	206
SD	7.18	12.27	2.47	1.07	1.85	0.34	17.63
Min	164	120	52.9	66.3	35.0	5.0	190
Max	187	152	61.3	69.3	41.7	6.4	230
n	17	17	16	6	17	17	4

TABLE 5. Measurements (mm) and weights (g) of specimens of *Lycocraix pyrrhopterus*

	Wing length	Tail length	Tarsus length	Total length	Bill head length	Bill width	Weight length
<i>L. p. pyrrhopterus</i>							
Males: adult							
Mean	190	143	42.0	77.6	46.6	11.4	269
SD	8.66	8.41	1.21	0.64	1.65	0.74	22.05
Min	175	127	38.7	76.9	41.8	9.6	242
Max	206	160	44.0	78.3	49.1	13.2	304
n	28	28	27	5	27	28	8
Females: adult							
Mean	186	139	41.7	75.6	44.6	10.9	250
SD	5.76	5.89	1.47	1.72	1.93	0.74	19.22
Min	176	131	38.9	73.1	40.8	9.4	218
Max	197	153	44.7	77.2	48.8	12.0	276
n	27	27	27	7	27	27	7
<i>L. p. macroura</i>							
Males: adult							
Mean	219	156	49.2	55.5	12.48		
SD	3.87	4.36	0.99	0.73	0.97		
Min	214	152	48.1	54.5	11.4		
Max	223	161	50.5	56.2	13.3		
n	4	4	4	4	4		
Females: adult							
Mean	209	145	46.5	52.9	11.6		
SD	0.58	2.00	2.23	0.58	0.15		
Min	209	143	44.8	52.6	11.4		
Max	210	147	49	53.6	11.7		
n	3	3	3	3	3		
<i>L. p. obiensis</i>							
Males: adult							
Mean	204	145	45.5	81.9	52.3	12.09	332
SD	7.59	5.49	1.57	2.37	2.51	0.61	25.54
Min	190	135	43.0	78.5	49.0	11	300
Max	224	156	49.3	86.7	56.2	13	370
n	26	26	26	13	26	26	9
Females: adult							
Mean	198	141	45.1	79.6	50.3	11.8	291
SD	5.91	6.36	1.71	1.51	2.14	0.62	27.47
Min	186	130	42.2	77.7	44.9	10.4	250
Max	208	152	47.7	82.0	54.4	12.6	316
n	19	19	19	6	19	19	5
all subspecies							
Males: adult							
Mean	198	145	44.1	80.7	49.8	11.79	302
SD	27.94	19.19	5.45	17.60	6.53	5.53	84.99
Min	175	127	38.7	76.9	41.8	9.6	242
Max	224	161	50.5	86.7	56.2	13.3	370
n	58	58	57	18	57	58	17
Females: adult							
Mean	192	140	43.3	77.5	47.3	11.3	267
SD	9.25	6.09	2.41	2.61	3.67	0.80	30.58
Min	176	130	38.9	73.1	40.8	9.4	218
Max	210	153	49.0	82.0	54.4	12.6	316
n	49	49	49	13	49	49	12

TABLE 6. Measurements (mm) and weights (g) of specimens of *Manucodia atra*

	Wing length	Tail length	Tarsus length	Total length	Bill head length	Bill width	Weight length
<i>M. a. atra</i>							
Males: adult							
Mean	181	150	38.4	68.0	38.9	8.9	224
SD	9.99	10.98	1.89	2.74	2.35	0.65	30.82
Min	160	133	34.5	61.5	34.3	7.8	170
Max	204	170	42.1	72.7	44.6	10.7	315
n	25	25	25	14	25	25	17
immature							
Mean	173	144	38.7	68.9	39.1	9.4	
SD	5.86	10.02	1.61	1.45	2.03	0.58	
Min	164	123	36.1	67.4	36.8	8.3	
Max	185	158	40.8	71.4	42.7	10.5	
n	11	11	11	6	11	11	
Females: adult							
Mean	175	143	38.1	66.4	37.5	8.9	207
SD	9.49	11.59	1.55	2.58	2.03	0.64	22.04
Min	159	127	35.4	62	34.1	7.5	155
Max	196	166	41.4	72.2	42.6	10	252
n	27	27	27	19	27	27	19
immature							
Mean	167	137	36.9	63.4	36.1	8.7	177
SD	7.73	9.40	1.96	1.87	2.43	0.75	23.54
Min	156	125	31.8	61.1	32.7	7.2	153
Max	182	155	39.7	67.1	41.7	10	200
n	17	17	17	9	17	17	3
<i>M. a. alter</i>							
Males: adult							
Mean	204	172	45.2	78.7	46.3	9.6	
SD	3.13	6.16	1.26	1.58	0.37	0.66	
Min	198	163	42.9	76.9	45.8	8.4	
Max	208	182	46.7	80.4	46.8	10.4	
n	7	7	7	5	7	7	
immature							
Mean	195	161	44.4	79.9	44.9	9.8	
n	1	1	1	1	1	1	
Females: adult							
Mean	191	160	42.6	74.8	42.9	9.3	
SD	7.37	7.62	1.08	1.59	0.86	0.59	
Min	182	152	40.9	71.8	40.8	8.6	
Max	201	172	44.2	76.4	44.2	10.3	
n	11	11	11	6	11	11	
<i>M. a. subalter</i>							
Males: adult							
Mean	195	165	41.2	72.5	41.8	9.2	275
SD	8.76	10.55	2.13	2.25	1.59	0.58	26.62
Min	175	144	34.7	67.3	38.6	8.2	238
Max	211	183	44.7	76.5	44.1	10.4	300
n	29	29	28	23	29	29	6
immature							
Mean	184	155	40.4	71.2	39.6	9.2	225
SD	9.18	10.64	1.74	3.84	1.88	0.58	
Min	172	140	37.5	65.8	37.6	8.4	
Max	199	168	42.0	74.9	42.7	10.2	
n	7	7	7	5	7	7	1
Females: adult							
Mean	185	154	39.7	68.9	39.1	9.0	212
SD	8.42	7.94	1.52	1.95	1.22	0.80	23.46
Min	173	138	36.0	65.1	36.9	7.2	190
Max	205	168	43.3	72.9	41.1	10.2	245
n	26	26	26	20	25	26	5

Immature						
Mean	188	160	41.6	71.1	39.9	9.7
SD	8.41	5.99	1.00	2.80	1.96	0.33
Min	177	153	40.3	67.2	36.9	9.3
Max	200	168	42.8	75.5	43.0	10.1
n	6	6	6	6	6	6

all subspecies							
Males: adult							
Mean	190	160	40.5	71.7	41.2	9.1	238
SD	12.04	13.11	2.89	4.04	2.96	0.64	36.88
Min	160	133	34.5	61.5	34.3	7.8	170
Max	211	183	46.7	80.4	46.8	10.7	315
n	61	61	60	42	61	61	23
immature							
Mean	178	149	39.7	70.8	39.6	9.4	225
SD	9.65	11.52	2.11	4.00	2.27	0.57	
Min	164	123	36.1	65.8	36.8	8.3	
Max	199	168	44.4	79.9	44.9	10.5	
n	19	19	19	12	19	19	1
Females: adult							
Mean	182	151	39.5	68.6	39.1	9.0	208
SD	10.41	11.62	2.14	3.47	2.48	0.71	21.92
Min	159	127	35.4	62.0	34.1	7.2	155
Max	205	172	44.2	76.4	44.2	10.3	252
n	64	64	64	45	63	64	24
immature							
Mean	172	143	38.1	66.5	37.1	8.9	177
SD	11.95	13.39	2.74	4.46	2.83	0.79	23.54
Min	156	125	31.8	61.1	32.7	7.2	153
Max	200	168	42.8	75.5	43.0	10.1	200
n	23	23	23	15	23	23	3

TABLE 7. Measurements (mm) and weights (g) of specimens of *Manucodia chalybata*

all subspecies							
Males: adult							
Wing length	158	Tail length	Tarsus length	Total head length	Bill length	Bill width	Weight
Mean	173	141	37.8	70.1	40.4	9.1	223
SD	5.42	7.03	1.68	2.30	1.75	0.53	24.88
Min	161	128	33.0	64.5	37.6	8.0	164
Max	183	152	41.1	75.7	44.4	10.0	265
n	37	37	34	25	36	37	36
immature							
Mean	169	133	38.3	70.0	40.2	8.9	209
SD	5.58	6.02	1.58	2.46	2.38	0.68	5.66
Min	157	120	34.9	67.4	33.9	7.7	205
Max	179	144	41.6	75.2	44.1	10.2	213
n	23	22	23	10	23	23	2
Females: adult							
Mean	167	136	37.1	66.2	38.3	8.7	209
SD	6.62	7.81	1.85	1.75	1.86	0.56	27.30
Min	153	124	33.5	61.8	34.4	7.7	160
Max	182	154	40.7	68.3	42.5	9.9	255
n	27	27	27	15	26	27	21
immature							
Mean	161	130	37.5	66.0	37.0	8.7	172
SD	5.34	5.69	1.63	2.75	2.04	0.47	13.48
Min	150	119	35.0	60.2	34.0	8.0	149
Max	175	138	39.9	71	41.8	9.5	181
n	21	21	21	17	21	19	5

TABLE 8. Measurements (mm) and weights (g) of specimens of *Manucodia comrii*

all subspecies							
Males: adult							
Wing length	160	Tail length	Tarsus length	Total head length	Bill length	Bill width	Weight
Mean	244	173	50.8	90.3	57.6	11.5	448
SD	6.58	5.74	1.22	1.83	1.86	0.59	
Min	229	162	48.4	85.8	53.2	10.4	
Max	257	182	52.7	93.9	61.0	12.7	
n	23	22	23	19	23	23	1
immature							
Mean	233	164	50.5		51.8	11.5	
n	1	1	1		1	1	
Females: adult							
Mean	231	165	49.3	85.0	53.2	11.1	418
SD	4.99	3.94	1.71	2.81	1.79	0.60	
Min	223	158	46.3	82.0	50.8	10.2	
Max	240	170	51.4	90.1	56.9	12.3	
n	13	13	13	10	13	13	1
immature							
Mean	219	163	48.3	83.8	51.4	11.2	
SD	7.09	8.41	0.72	2.40	2.24	0.24	
Min	207	149	47.2	82.1	49.6	10.9	
Max	224	171	49.0	85.5	54.7	11.5	
n	5	5	5	2	5	5	
<i>M. c. comrii</i>							
<i>M. c. comrii</i>							
Wing length	158	Tail length	Tarsus length	Total head length	Bill length	Bill width	Weight
Mean	226	158	49.5	85.5	54.8	11.1	
SD	7.32	6.31	1.33	2.84	1.81	0.64	
Min	213	148	46.7	80.6	51.6	10.1	
Max	235	169	51.6	88.0	56.5	12.3	
n	14	14	14	7	14	14	
Females: adult							
Mean	217	154	48.4	83.7	52.8	10.8	
SD	4.59	7.60	1.77	2.35	2.36	0.35	
Min	207	147	46.3	81.2	49.9	10.2	
Max	223	172	52.0	87.8	57.1	11.2	
n	9	9	9	6	9	9	
immature							
Mean	204	149	45.4	80.4	49.7	9.9	
n	1	1	1	1	1	1	
<i>M. c. trobriandi</i>							
<i>M. c. trobriandi</i>							
Wing length	158	Tail length	Tarsus length	Total head length	Bill length	Bill width	Weight
Mean	226	158	49.5	85.5	54.8	11.1	
SD	7.32	6.31	1.33	2.84	1.81	0.64	
Min	213	148	46.7	80.6	51.6	10.1	
Max	235	169	51.6	88.0	56.5	12.3	
n	14	14	14	7	14	14	
Females: adult							
Mean	217	154	48.4	84.5	53.1	11.0	418
SD	8.63	7.92	1.75	2.65	2.00	0.54	
Min	209	147	46.3	81.2	49.9	10.2	
Max	240	172	52.0	90.1	57.1	12.3	
n	22	22	22	16	22	22	1
immature							
Mean	217	160	47.8	82.7	51.1	11.0	
SD	8.93	9.35	1.35	2.60	2.12	0.56	
Min	204	149	45.4	80.4	49.6	9.9	
Max	224	171	49.0	85.5	54.7	11.5	
n	6	6	6	3	6	6	

TABLE 9. Measurements (mm) and weights (g) of specimens of *Manucodia jobiensis*

	Wing length	Tail length	Tarsus length	Total length	Bill head	Bill width	Weight length
<i>M. j. jobiensis</i>							
Males: adult							
Mean	184	140	37.6	73.9	40.6	9.7	245
SD	6.13	6.16	1.31		0.39	0.73	16.97
Min	178	132	36.1		40	8.9	233
Max	192	147	39.3		40.9	10.6	257
n	4	4	4	1	4	4	2
Females: adult							
Mean	174	130	36.8	65.7	37.2	9.1	205
SD	1.41	2.83	0.64	0.07	0.71	0.57	
Min	173	128	36.3	65.6	36.7	8.7	
Max	175	132	37.2	65.7	37.7	9.5	
n	2	2	2	2	2	2	1
<i>M. j. rubiensis</i>							
Males: adult							
Mean	175	132	37.1	68.5	38.7	9.2	222
SD	6.64	7.04	1.76	2.91	2.26	0.70	8.23
Min	161	119	34	63.1	34.6	7.6	212
Max	194	146	40.5	73.4	42.4	10.5	232
n	26	25	25	21	26	26	6
immature							
Mean	170	128	36.6	66.4	38.4	9.0	197
SD	3.10	4.24	0.78	1.03	1.25	0.62	
Min	167	123	35.6	65.5	37.4	8.3	
Max	174	132	37.3	67.5	39.8	9.8	
n	4	4	4	3	3	4	1
Females: adult							
Mean	168	127	36.1	65.6	37.0	9.2	174
SD	4.94	6.37	1.23	2.56	1.34	0.66	24.96
Min	157	113	33.5	61.2	34.6	7.8	150
Max	177	141	39.2	69.5	39.1	10.1	200
n	24	24	24	19	24	24	4
immature							
Mean	166	119	35.3	62.2	35.5	8.8	
SD	4.24	2.12	0.14	3.18	1.48	0.49	
Min	169	120	35.2	59.9	34.4	8.4	
Max	169	120	35.4	64.4	36.5	9.1	
n	2	2	2	2	2	2	
all subspecies							
Males: adult							
Mean	176	133	37.1	68.7	39.0	9.3	228
SD	7.24	7.41	1.70	3.07	2.20	0.71	14.30
Min	161	119	34.0	63.1	34.6	7.6	212
Max	194	147	40.5	73.9	42.4	10.6	257
n	30	29	29	22	30	30	8
immature							
Mean	170	128	36.6	66.4	38.4	9.0	197
SD	3.10	4.24	0.78	1.03	1.25	0.62	
Min	167	123	35.6	65.5	37.4	8.3	
Max	174	132	37.3	67.5	39.8	9.8	
n	4	4	4	3	3	4	1
Females: adult							
Mean	169	127	36.1	65.6	37.0	9.2	180
SD	5.01	6.20	1.20	2.43	1.30	0.64	25.74
Min	157	113	33.5	61.2	34.6	7.8	150
Max	177	141	39.2	69.5	39.1	10.1	205
n	26	26	26	21	26	26	5
immature							
Mean	166	119	35.3	62.2	35.5	8.8	
SD	4.24	2.12	0.14	3.18	1.48	0.49	
Min	163	117	35.2	59.9	34.4	8.4	
Max	164	120	35.4	64.4	36.5	9.1	
n	2	2	2	2	2	2	

TABLE 10. Measurements (mm) and weights (g) of specimens of *Manucodia kerawrenii*

	Wing length	Tail length	Tarsus length	Total length	Bill head	Bill width	Weight length
<i>M. k. kerawrenii</i>							
Males: adult							
Mean	160	124	34.0	62.5	33.5	8.0	149
SD	4.84	5.47	1.55	1.54	1.31	0.70	14.06
Min	144	110	30.2	50.1	31.1	6.6	130
Max	166	133	37.0	64.7	36.3	9.8	175
n	24	24	24	16	24	24	7
immature							
Mean	155	125	34.8	62.7	33.2	7.7	
SD	6.06	2.45	1.21	0.59	0.91	0.40	
Min	148	122	32.9	61.8	32.1	6.9	
Max	165	129	36.7	63.1	35.0	8.2	
n	8	8	8	4	8	8	
Females: adult							
Mean	152	117	32.9	59.8	31.6	7.7	136
SD	5.16	5.46	1.02	1.52	1.62	0.45	4.76
Min	139	108	31.2	57.5	28.8	7.0	130
Max	158	125	34.7	62.1	33.6	8.5	140
n	15	15	15	7	15	15	7
immature							
Mean	145	117	31.3	59.8	32.9	7	126
n	1	1	1	1	1	1	1
<i>M. k. gouldi</i>							
Males: adult							
Mean	165	135	36.8	62.6	33.7	7.0	161
SD	4.64	3.80	1.31	1.47	1.04	0.36	12.81
Min	155	124	33.8	60.3	31.8	6.2	150
Max	177	142	39.2	65.7	35.7	7.7	184
n	35	35	35	17	32	33	6
immature							
Mean	155	137	37.5	63.7	35.2	6.7	
n	1	1	1	1	1	1	
Females: adult							
Mean	158	127	35.0	60.1	31.7	7.1	138
SD	3.79	2.33	1.15	1.58	1.04	0.47	
Min	151	122	32.8	56.6	30.1	6.3	
Max	166	130	37.7	61.6	33.8	8.2	
n	16	16	15	8	16	16	1
immature							
Mean	147	124	33.66	59.1	31.9	6.8	
SD	5.13	2.30	1.42	1.80	1.08	0.74	
Min	142	122	31.5	57.3	30.5	6.0	
Max	154	127	35.5	59.9	33.2	7.6	
n	5	5	5	3	5	5	
<i>M. k. jamesii</i>							
Males: adult							
Mean	164	128	35.8	64.1	34.3	8.2	187
SD	4.32	4.67	1.49	2.65	1.71	0.59	4.95
Min	155	119	32.5	57.1	29.7	7.4	183
Max	171	138	38.7	68.2	36.4	9.8	190
n	26	24	26	14	26	26	2
immature							
Mean	143	114	37.3	59.5	31.9	6.9	175
SD							0.71
Min							174
Max							175
n	1	1	1	1	1	1	2
Females: adult							
Mean	160	125	35.6	61.7	33.3	7.9	160
SD	5.23	5.34	1.88	1.42	1.62	0.54	17.68
Min	148	119	31.8	60.2	31.0	7.3	147
Max	166	135	38.7	63.6	37.1	9.3	172
n	13	13	13	4	13	13	2

immature								Females: adult							
Mean	151	123	34.0	61.4	32.6	7.5		Mean	149	117	33.2	58.9	31	7.9	145
SD	6.15	3.46	1.32	1.81	1.45	0.63		SD	3.21	4.59	1.92	0.62	0.51	0.42	8.26
Min	142	118	32.0	58.7	31.0	6.6		Min	142	110	30.0	58.2	30.4	7.3	133
Max	159	128	35.9	63.8	35.7	8.5		Max	152	123	34.8	59.7	32.1	8.6	154
n	9	9	9	8	9	9		n	8	8	8	4	8	8	6
<i>M. k. hunsteini</i>															
Males: adult							Males: adult							<i>M. k. mayri</i>	
Mean	188	139	39.2	67.3	36.6	8.5	Mean	169	132	36.7	66.4	35.9	7.8	172	
SD	3.71	3.07	0.81	1.07	0.80	0.59	SD	3.65	4.07	0.96	0.92	0.61	0.23	8.52	
Min	179	133	37.1	65.8	35.2	7.7	Min	164	128	35.0	65.0	34.9	7.4	160	
Max	194	143	40.6	68.6	37.6	9.7	Max	175	138	38.2	67.3	36.8	8.1	184	
n	13	13	13	8	13	13	n	7	6	7	5	6	7	10	
immature															
Mean	176	133	40.0	66.0	35.9	8.2	Mean	160	125	36.5	62.2	32.3	7.4		
SD	4.04	0.58	0.49	0.14	0.50	0.57	SD	1	1	1	1	1	1		
Min	174	133	39.7	65.9	35.4	7.7									
Max	181	134	40.6	66.1	36.4	8.8									
n	3	3	3	2	3	3									
Females: adult															
Mean	182	135	37.9	62.9	34.8	8.3	Mean	160	126	36.0	63.5	33.3	7.5	152	
SD	2.60	3.64	1.62	1.67	1.22	0.36	SD	6.38	6.16	1.53	0.72	0.77	0.33	11.06	
Min	179	132	35.0	61.4	32.5	7.9	Min	151	120	34.3	62.7	32.4	7.1	134	
Max	186	141	39.7	64.7	36.8	8.9	Max	166	135	38.2	64.5	34.3	7.9	170	
n	8	8	8	3	8	8	n	5	5	5	5	5	5	10	
immature															
Mean	172	131	37.5	62.6	33.7	8.4	Mean	155	124	35.4	61.7	32.3	7.4	163	
SD	2.94	4.19	1.46	0.85	0.66	0.58	SD	5.51	5.13	0.10	1.73	1.81	0.58		
Min	169	127	36.3	61.7	32.9	7.7	Min	151	118	35.3	60.2	31.0	7.1		
Max	175	137	39.5	63.4	34.3	9.1	Max	161	128	35.5	63.6	34.4	8.1		
n	4	4	4	3	4	4	n	3	3	3	3	3	3	1	
<i>M. k. purpureoviolaceus</i>															
Males: adult							Males: adult							<i>M. k. adelberti</i>	
Mean	168	127	37.0	66.0	35.4	8.0	Mean	163	130	33.9		33.0	7.9	175	
SD	3.94	5.04	1.14	1.72	1.54	0.51	SD	3.89	5.42	2.76		1.21	0.62	9.54	
Min	157	115	34.4	61.5	31.0	7.0	Min	156	122	27.8		30.8	7.1	166	
Max	174	138	38.8	68.9	38.4	9.3	Max	168	139	37.0		34.8	9.2	188	
n	35	35	35	26	34	35	n	10	10	9		9	10	6	
immature															
Mean	166	126	37.8	64.7	35.3	7.6	Mean	146	121	34.45	55.1	30.85	7.45	132	
SD	6.24	1.71	0.73	0.49	0.83	0.37	SD	0	1.41	0.64		2.19	0.21	4.95	
Min	159	124	37.2	64.3	34.4	7.1	Min	146	120	34.0		29.3	7.3	128	
Max	174	128	38.6	65	36.4	8	Max	146	122	34.9		32.4	7.6	135	
n	4	4	4	2	4	4	n	2	2	2	1	2	2	2	
Females: adult															
Mean	162	123	35.8	63.3	33.6	7.6	Mean	157	126	32.5		32.1	7.5	153	
SD	6.28	4.71	1.65	1.57	1.07	0.35	SD	1	1	1		1	1	1	
Min	148	113	31.5	60.3	31.6	6.7	Min	146	120	34.0		29.3	7.3		
Max	180	133	38.2	67.1	36.5	8.2	Max	146	122	34.9		32.4	7.6		
n	29	29	29	21	29	29	n	2	2	2	1	2	2	2	
immature															
Mean	157	125	35.4	62.7	33.1	7.9	Mean	158	134	37.2	62.4	33.2	8.0		
SD	3.79	1.15	1.76	1.53	1.12	0.95	SD	4.00	7.02	0.66	1.30	0.82	0.49		
Min	154	124	34.3	61.5	32.3	7.0	Min	154	127	36.6	61.1	32.5	7.4		
Max	161	126	37.4	64.4	34.4	8.9	Max	162	141	37.9	63.7	34.1	8.3		
n	3	3	3	3	3	3	n	3	3	3	3	3	3		
<i>M. k. neumanni</i>															
Males: adult							Males: adult							<i>M. k. coryensis</i>	
Mean	156	124	33.1	61.7	32.9	7.7	Mean	168	136	35.5	63.5	33.6	7.6		
SD	3.53	3.51	0.69	2.79	1.82	0.37	SD	2.06	2.63	1.73	0.57	0.44	0.37		
Min	150	119	32.0	58.7	30.2	7.0	Min	166	132	34.2	63.1	33.0	7.3		
Max	162	129	34.3	65.8	36.4	8.2	Max	170	138	38.0	63.9	33.9	8.1		
n	11	11	11	6	10	11	n	4	4	4	2	4	4		
immature															
Mean	145	117	33.9	60	31.8	8.2	Mean	158	134	37.2	62.4	33.2	8.0		
SD	4.24	4.24	0.78	0.28	0.28	0.07	SD	4.00	7.02	0.66	1.30	0.82	0.49		
Min	142	114	33.3	59.8	31.6	8.1	Min	154	127	36.6	61.1	32.5	7.4		
Max	148	120	34.4	60.2	32.0	8.2	Max	162	141	37.9	63.7	34.1	8.3		
n	2	2	2	2	2	2	n	3	3	3	3	3	3		
<i>M. k. diamondi</i>															
Males: adult							Males: adult								
Mean	171	129	37.4	65.2	35.6	7.8	Mean	171	129	37.4	65.2	35.6	7.8	177	
SD	5.82	4.87	1.70	0.85	1.48	0.51	SD	5.82	4.87	1.70	0.85	1.48	0.51	11.37	
Min	156	121	34.2	63.7	33.4	7.3	Min	156	121	34.2	63.7	33.4	7.3	168	
Max	176	134	40.0	65.9	38.0	9.0	Max	176	134	40.0	65.9	38.0	9.0	190	
n	11	11	9	6	11	11	n	11	11	9	6	11	11	3	

immature							
Mean	164	127	37.7		34.1	6.8	174
n	1	1	1		1	1	1
Females: adult							
Mean	162	123	35.2	60.6	32.7	7.4	172
SD	3.83	1.50	2.06	2.19	1.67	0.67	0.71
Min	159	121	32.2	58.2	30.9	6.7	171
Max	167	124	36.7	62.5	34.8	8.3	172
n	4	4	4	3	4	4	2
immature							
Mean	172	128	36.2		33.6	7.7	
n	1	1	1		1	1	
all subspecies							
Males: adult							
Mean	167	130	36.1	64.4	34.4	7.8	171
SD	8.32	6.39	2.10	2.48	1.72	0.67	19.79
Min	144	110	27.8	57.1	29.7	6.2	130
Max	194	143	40.6	68.9	38.4	9.8	240
n	176	175	173	100	169	174	49
immature							
Mean	159	127	36.6	62.8	33.8	7.7	168
SD	10.09	6.41	2.07	2.01	1.49	0.54	18.31
Min	142	114	32.9	59.5	31.6	6.7	136
Max	181	141	40.6	66.1	36.4	8.8	182
n	24	24	24	16	24	24	5
Females: adult							
Mean	160	124	35.1	61.8	32.8	7.6	151
SD	9.23	6.53	2.06	2.19	1.63	0.53	14.77
Min	139	108	30.0	56.6	28.8	6.3	130
Max	186	141	39.7	67.1	37.1	9.3	182
n	99	99	98	55	99	99	36
immature							
Mean	155	125	34.8	61.1	32.6	7.5	141
SD	9.92	4.39	1.84	2.26	1.40	0.74	16.08
Min	142	117	31.3	55.1	29.3	6.0	126
Max	175	137	39.5	64.4	35.7	9.1	163
n	28	28	28	22	28	28	5

TABLE 11. Measurements (mm) and weights (g) of specimens of *Paradigalla carunculata*

	Wing length	Tail length	Tail central length	Tarsus length	Total head length	Bill length	Bill width	Weight
Males: adult								
Mean	186	132	160	49.0		43.1	5.3	
SD	6.06	4.38	10.61	0.77		2.31	0.68	
Min	180	122	132	47.9		38.0	4.6	
Max	201	137	170	50.2		45.0	6.7	
n	10	10	10	9		8	9	
immature								
Mean	171	124	133	47.9	69.6	43.7	5.7	
SD	7.25	6.41	9.29	2.24	0.71	0.77	0.36	
Min	160	115	121	44.4	69.1	42.4	5.2	
Max	179	130	148	49.8	70.1	44.5	6.4	
n	7	7	7	7	2	7	7	
Females: adult								
Mean	165	125	132	45.6	67.9	42.2	6.0	170
SD	6.66	5.78	4.71	2.92		1.57	0.41	
Min	157	118	125	41.4		39.0	5.2	
Max	175	131	138	50.2		44.0	6.4	
n	11	9	9	11	1	10	9	1

TABLE 12. Measurements (mm) and weights (g) of specimens of *Paraligalla brevicauda*

	Wing length	Tail length	Tail central length	Tarsus length	Total head length	Bill length	Bill width	Weight
Males: adult								
Mean	158	53	51	44.0	71.6	44.2	5.6	173
SD	3.84	9.62	7.63	1.06	0.78	1.65	0.41	12.12
Min	151	44	42	41.5	69.4	39.6	4.9	160
Max	168	88	73	45.6	74.4	48.9	6.2	184
n	25	25	24	25	8	23	25	3
immature								
Mean	159	78	78	43.2	69.6	44.0	5.8	169
SD	3.66	16.04	14.60	1.59	2.38	2.12	0.32	6.86
Min	148	54	53	39.8	67.1	40.1	5.2	160
Max	164	107	106	46.3	73.8	48.0	6.6	175
n	30	29	26	30	14	27	30	4
Females: adult								
Mean	150	68	67	41.9	70.9	44.4	5.9	163
SD	2.96	15.50	12.78	1.10	1.42	1.49	0.35	10.61
Min	144	45.7	53	39.1	67.3	42.1	5.2	156
Max	154	96	91	43.9	72.3	47.9	6.5	170
n	26	26	23	26	12	25	25	2
immature								
Mean	153	89	78	42.4	70	44.7	6.3	
SD	0.71	5.66	15.56	0.85		0.78		
Min	152	85	67	41.8		44.1		
Max	153	93	89	43.0		45.2		
n	2	2	2	2	1	2	2	

TABLE 13. Measurements (mm) and weights (g) of specimens of *Ptiloris paradiseus*

	Wing length	Tail length	Tail central length	Tarsus length	Total head length	Bill length	Bill width	Weight
Males: adult								
Mean	160	98	89	33.3	80.1	54.1	6.4	141
SD	2.75	2.11	2.20	1.34	2.19	2.48	0.42	11.85
Min	153	92	84	30.1	75.0	49.3	5.6	134
Max	165	103	95	36.2	84.4	61.6	7.2	155
n	37	37	37	35	21	34	36	3
subadult								
Mean	154	96	94	33.9	80.3	54.1	6.5	
SD	2.14	1.70	1.62	0.97	1.50	1.13	0.34	
Min	151	94	91	31.9	77.5	52.7	5.8	
Max	158	100	97	35.2	81.8	56.7	6.9	
n	13	12	12	13	7	12	13	
immature								
Mean	148	94	91	32.9	80.5	54.5	6.0	114
SD	6.35	3.77	2.65	1.19	3.58	3.48	0.33	159
Min	139	89	88	31.4	77.3	51.9	5.5	113
Max	154	98	93	34.5	85.3	60.6	6.4	115
n	5	4	3	5	4	5	5	2
Females: adult								
Mean	144	91	87	32.3	82.9	58.5	6.1	104
SD	5.07	3.45	3.37	1.41	2.23	2.97	0.38	9.27
Min	137	86	83	29.5	76.5	51.1	5.2	86
Max	156	99	96	35.6	85.8	65.8	7.0	112
n	26	26	23	24	15	25	26	6

TABLE 14. Measurements (mm) and weights (g) of specimens of *Ptiloris victoriae*

	Wing length	Tail length	Tail central length	Tarsus length	Total length	Bill head length	Bill width	Weight
Males: adult								
Mean	139	81	77	32.1	68.6	43.2	6.0	105
SD	3.05	1.75	2.11	1.00	1.32	1.24	0.35	7.13
Min	133	77	72	29.8	65.5	40.1	5.3	91
Max	146	86	81	34.6	71.7	45.7	6.9	119
n	51	51	51	51	40	51	51	22
subadult								
Mean	134	83	81	32.4	67.4	42.9	6.0	105
SD	3.63	1.77	2.11	1.01	1.33	1.83	0.34	
Min	129	81	79	30.7	65.5	40.0	5.5	
Max	138	86	86	34.2	69.4	45.7	6.5	
n	11	10	9	11	7	11	11	1
immature								
Mean	129	81	79	32.3	67.4	42.7	5.9	93
SD	3.91	2.29	2.00	1.39	0.85	1.35	0.35	5.31
Min	121	75	74	29.7	66.2	40.3	5.3	82
Max	134	85	83	34.5	68.6	45.8	6.5	104
n	25	23	20	24	11	24	25	22
Females: adult								
Mean	125	78	76	30.3	68.9	44.7	5.9	86
SD	5.00	3.59	2.84	1.55	1.85	2.22	0.30	5.87
Min	116	72	72	26.0	64.2	40.1	5.4	77
Max	136	85	83	33.1	72.3	49	6.5	96
n	34	33	31	31	27	33	32	25

TABLE 15. Measurements (mm) and weights (g) of specimens of *Ptiloris magnificus*

	Wing length	Tail length	Tail central length	Tarsus length	Total length	Bill head length	Bill width	Weight
Males: adult								
Mean	192	102	97	39.6	88.4	59.7	6.9	207
SD	4.54	4.07	4.54	1.09	2.06	2.37	0.49	13.61
Min	182	92	88	37.2	84.7	54.2	5.8	180
Max	200	110	108	42.3	91.2	63.5	8.0	230
n	31	31	29	29	10	31	31	20
subadult								
Mean	186	109	108	40.1	86.1	59.7	7.3	182
SD	7.22	2.83	5.82	1.13	3.68	3.00	0.58	
Min	177	105	97	37.9	83.5	56	6.3	
Max	196	114	116	41.5	88.7	65.5	7.8	
n	9	9	7	9	2	9	8	1
immature								
Mean	177	109	110	39.9	89.9	58.9	7.2	180
SD	4.07	3.78	2.77	1.14	1.36	2.63	0.38	8.28
Min	169	102	105	36.9	88.2	50.6	6.6	168
Max	183	118	117	41.2	91.7	62.6	8.2	190
n	20	20	18	20	6	20	20	9
Females: adult								
Mean	157	99	99	35.5	80.8	52.6	7.0	142
SD	5.22	4.80	5.41	0.90	2.15	2.78	0.38	19.58
Min	147	91	90	33.1	77.6	44.6	6.2	120
Max	165	113	115	36.9	83.8	56.9	7.9	185
n	25	25	25	24	8	25	25	8
P. m. magnificus								

	<i>P. m. alberti</i>								
Males: adult									
Mean	181	99	91	37.9	82.3	55.0	6.0	160	
SD	3.19	2.33	3.14	1.01	1.38	1.51	0.29	12.04	
Min	174	94	83	35.6	79.5	50.9	5.6	143	
Max	187	106	98	40.1	86	57.3	6.8	171	
n	40	38	35	39	19	34	38	4	
subadult									
Mean	171	102	102	37.8	81.1	54.7	5.9	137	
SD	5.75	5.01	5.25	1.33	3.91	1.55	0.53		
Min	160	94	92	35.1	71.9	50.5	5.3		
Max	182	111	107	39.5	83.7	56.3	7.5		
n	14	14	8	14	8	14	14	1	
immature									
Mean	161	101	102	38.3	80.5	54.1	6.0	131	
SD	7.12	3.11	2.61	0.80	3.19	1.74	0.29		
Min	151	97	98	37.6	76.1	50.8	5.6		
Max	169	104	105	39.3	83.3	56	6.3		
n	6	5	5	4	6	5	5	1	
Females: adult									
Mean	149	96	93	35.1	76.6	50.6	5.8	104	
SD	7.64	6.10	5.65	3.06	3.77	2.96	0.25	9.07	
Min	139	88	86.4	31.1	71.8	45.8	5.4	94	
Max	165	108	107	44.2	82.4	55.7	6.3	112	
n	24	21	16	24	18	23	24	3	
	<i>P. m. intercedens</i>								
Males: adult									
Mean	193	101	96	40.4	84.1	55.8	7.0	184	
SD	3.03	2.92	3.73	1.44	2.04	2.01	0.39	15.20	
Min	188	96	90	34.8	80.4	52.4	6.2	155	
Max	199	106	105	42.7	88.1	61.9	7.7	214	
n	25	25	25	23	17	24	25	12	
subadult									
Mean	191	109	102	40.1	85.1	55.0	7.2	166	
SD	4.36	2.03	5.22	1.48	1.14	1.51	0.40	12.85	
Min	186	107	98	38.2	83.8	52.0	6.5	120	
Max	197	113	109	42.4	86.6	57.2	7.8	205	
n	9	9	5	9	6	9	9	3	
immature									
Mean	175	108	106	40.5	83.2	54.8	7.1	176	
SD	5.94	4.02	3.91	1.11	1.33	1.55	0.54	9.49	
Min	162	103	100	38.4	81.5	51.3	5.7	165	
Max	187	116	113	42.5	87	57.5	8.2	189	
n	20	20	19	19	17	19	20	7	
Females: adult									
Mean	152	98	97	35.2	75.0	50.0	6.8	126	
SD	4.46	3.26	3.06	1.21	1.54	1.31	0.34	13.10	
Min	145	92	91	32.6	72.0	45.3	6.3	102	
Max	162	103	105	38.1	77.5	50.7	7.6	149	
n	27	27	23	27	20	27	27	15	
	all subspecies								
Males: adult									
Mean	188	101	95	39.1	84.3	56.8	6.6	194	
SD	7.13	3.39	4.66	1.57	2.93	2.89	0.63	21.38	
Min	174	92	83	35.6	79.5	50.9	5.6	143	
Max	200	110	108	42.7	91.2	63.5	8.0	230	
n	96	94	89	91	46	89	94	36	
subadult									
Mean	181	106	104	39.1	83.2	56.2	6.7	163	
SD	10.68	4.94	5.89	1.77	3.65	3.01	0.84	34.32	
Min	160	94	92	35.1	71.9	50.5	5.3	120	
Max	197	114	116	42.4	88.7	65.5	7.8	205	
n	32	32	20	32	16	32	31	5	
immature									
Mean	174	107	107	40.0	84.3	56.5	7.0	175	
SD	7.27	4.39	4.18	1.27	3.57	2.98	0.56	14.21	
Min	161	97	98	36.9	76.1	50.6	5.6	131	
Max	187	118	117	42.5	91.7	62.6	8.2	190	
n	46	45	42	44	27	46	45	17	
Females: adult									
Mean	153	98	97	35.3	76.6	50.3	6.6	128	
SD	6.67	4.86	5.33	1.92	3.37	3.08	0.62	18.67	
Min	139	85	86.4	31.1	71.8	44.6	5.4	94	
Max	165	113	115	44.2	83.8	56.9	7.9	185	
n	76	73	64	75	46	75	76	26	

TABLE 16. Measurements (mm) and weights (g) of specimens of *Semioptera wallacii*

	Wing length	Tail length	Tail central length	Tarsus length	Total length	Bill head length	Bill width	Weight
<i>S. w. wallacii</i>								
Males: adult								
Mean	156	78	66	41.9	73.0	45.1	6.6	163
SD	2.56	4.61	4.17	1.08	1.37	1.63	0.39	11.02
Min	152	71	60	39.4	70.6	41.2	5.7	152
Max	162	90	81	44.3	74.7	47.5	7.3	174
n	29	28	27	28	14	26	25	3
subadult								
Mean	156	85	79	42.2	71.4	45.5	6.7	
SD	2.43	3.27	2.03	0.64	1.84	0.60	0.34	
Min	153	79	66	41.1	70.1	44.8	6.3	
Max	159	87	87	42.9	72.7	46.4	7.2	
n	6	6	6	6	2	5	5	
immature								
Mean	150	87	88	41.3	72.0	44.9	6.7	153
SD	4.62	1.58	2.00	2.18	1.52	0.98	0.44	3.54
Min	141	85	84	35.9	70.2	43.6	6.2	150
Max	156	89	90	43.5	74.1	47.2	7.7	155
n	11	11	11	11	7	11	11	2
Females: adult								
Mean	145	84	85	39.9	70.7	43.8	6.7	135
SD	4.45	3.49	4.04	1.49	0.95	1.02	0.42	8.54
Min	135	78	76	37.1	69.1	41.5	6.0	126
Max	154	94	96	43.3	72.2	46.5	7.7	143
n	26	25	24	25	17	24	25	3
S. w. holmaherae								
Males: adult								
Mean	157	85	74	41.7	72.2	44.2	6.7	
SD	2.64	3.40	6.27	1.20	1.36	1.79	0.38	
Min	151	79	67	39.0	70.3	39.9	6.1	
Max	162	93	93	43.9	74.0	47.8	7.6	
n	32	31	30	30	9	31	30	
subadult								
Mean	154	86	82	41.9	71.0	43.6	6.5	
SD	4.04	1.92	6.98	0.55	2.91	2.67	0.46	
Min	149	84	74	41.4	67.8	41.5	5.9	
Max	160	89	90	42.6	73.5	48.2	6.9	
n	5	5	5	5	3	5	5	
immature								
Mean	154	90	91	41.5	70.1	43.9	7.2	
SD	2.92	3.18	3.28	0.95	1.04	1.68	0.39	
Min	147	84	86	39.5	68.8	42.3	6.6	
Max	157	94	96	42.5	71.3	47.1	7.8	
n	8	8	8	8	4	7	8	
Females: adult								
Mean	144	86	87	38.6	70.0	43	6.9	
SD	3.30	2.30	2.57	1.00	1.46	1.46	0.42	
Min	138	81	84	36.2	68.0	40.6	6.1	
Max	151	90	91	40.3	72.0	46.7	7.5	
n	25	25	21	25	13	24	25	
all subspecies								
Males: adult								
Mean	157	82	70	41.8	72.7	44.6	6.7	163
SD	2.62	5.36	6.65	1.14	1.38	1.76	0.39	11.02
Min	152	71	60	39.0	70.3	39.9	5.7	152
Max	162	93	93	44.3	74.7	47.8	7.4	174
n	61	59	57	58	23	57	55	3
subadult								
Mean	155	85	80	42.1	71.2	44.6	6.6	
SD	3.23	2.76	7.98	0.59	2.27	2.06	0.40	
Min	149	79	66	41.1	67.8	41.5	5.9	
Max	160	89	90	42.9	73.5	48.2	7.2	
n	11	11	11	11	5	10	10	

	Immature								
Mean	152	88	89	41.4	71.3	44.5	6.9	153	
SD	4.27	2.75	2.96	1.73	1.62	1.35	0.49	3.54	
Min	141	84	84	36.9	68.8	42.3	6.2	150	
Max	157	94	96	43.5	74.1	47.2	7.8	165	
n	19	19	19	19	11	18	19	2	

TABLE 17. Measurements (mm) and weights (g) of specimens of *Seleucidis melanoleuca*

	Wing length	Tail length	Tail central length	Tarsus length	Total length	Bill head length	Bill width	Weight
<i>S. m. melanoleuca</i>								
Males: adult								
Mean	177	71	70	41.0	102.0	71.0	7.4	205
SD	4.27	4.22	3.54	2.19	2.33	2.22	0.6	11.15
Min	167	62	63	30.6	95.4	65.2	6.0	190
Max	185	86	78	43.5	105.9	74.8	8.3	217
n	34	34	33	33	18	32	34	4
subadult								
Mean	179	97	100	41.1	100.1	70.5	7.5	196
SD	5.32	8.27	9.58	1.03	2.28	1.80	0.63	
Min	169	81	78	38.0	95.0	64.9	6.3	
Max	187	112	112	43.0	102.9	73.1	8.7	
n	22	22	20	22	9	22	22	1
immature								
Mean	177	110	108	41.4	100.3	70.1	7.8	202
SD	4.58	4.16	4.73	1.30	2.40	2.52	0.67	19.1
Min	163	102	101	37.7	96.3	63.6	6.4	182
Max	184	120	121	43.3	103.9	73.1	8.8	220
n	22	21	21	22	8	22	22	3
Females: adult								
Mean	165	108	108	38.0	92.8	64.5	7.5	187
SD	3.17	3.22	4.00	0.81	2.82	2.53	0.68	1.41
Min	158	102	101	36.6	84.3	56.7	6.4	186
Max	171	113	115	39.9	96.7	68.6	8.9	188
n	21	19	19	20	16	21	20	2
Males: adult								
Mean	168	65	66	39.3	95.5	65.3	6.8	189
SD	2.39	2.64	2.15	1.06	2.11	1.80	0.74	10.58
Min	163	61	62	37.0	92.1	62.5	5.7	170
Max	173	70	71	41.9	98.4	68.2	8.4	202
n	25	25	25	25	12	25	25	12
subadult								
Mean	168	93	92	39.6	95.2	66.2	7.0	188
SD	3.59	5.65	8.44	1.08	1.89	2.21	0.68	15.79
Min	164	85	75	37.1	92.8	63.7	6.1	153
Max	179	107	104	41.2	97.7	71.5	8.6	200
n	16	16	15	16	6	16	16	9
immature								
Mean	166	100	97	39.1	93.7	63.9	6.9	175
SD	2.33	4.24	3.02	0.87	3.19	2.67	0.81	11.88
Min	161	95	92	36.7	89.9	60.0	5.1	168
Max	169	112	103	40.1	98.8	69.0	8.4	188
n	15	15	12	15	8	14	14	5
Females: adult								
Mean	158	99	98	36.5	88.8	60.5	7.1	161
SD	4.46	4.45	5.90	1.51	1.02	2.25	0.60	1.73
Min	152	93	90	34.3	87.0	55.5	6.2	160
Max	169	111	112	39.9	89.8	64.1	8.2	163
n	19	19	18	19	6	18	19	3

all subspecies											E. a. geisleri							
Males: adult											subadult							
Mean	173	69	68	40.3	99.4	68.5	7.1	193			Mean	151	124	123	34.38	94.9	74.0	5.9
SD	5.81	4.55	3.70	1.97	3.92	3.53	0.73	12.57			SD	0.89	4.44	5.17	0.85	1.09	2.27	0.53
Min	163	61	62	30.6	92.1	62.5	5.7	170			Min	150	119	116	33.3	94.0	71.1	5.3
Max	185	86	78	43.5	105.9	74.8	8.4	217			Max	152	130	130	35.3	96.5	76.7	6.4
n	59	59	58	58	30	57	59	16			n	5	5	5	5	4	5	5
subadult											immature							
Mean	174	95	97	40.5	98.2	68.7	7.3	189			Mean	150	127	129	34.2	76.5	5.2	103
SD	6.98	7.43	9.95	1.26	3.25	2.89	0.69	15.08			n	1	1	1	1	1	1	1
Min	164	81	75	37.1	92.8	63.7	6.1	153			Females: adult							
Max	187	112	112	43.0	102.9	73.1	8.7	200			Mean	147	123	122	33.9	100.3	77.6	6.1
n	38	38	35	38	15	38	38	10			SD	2.51	3.97	4.45	0.73	41.8	4.52	1.53
immature											Min	143	116	115	32.3	91.3	65.1	9.2
Mean	173	106	104	40.4	97.0	67.7	7.5	185			Max	153	134	132	35.1	106.6	83.7	11
SD	6.98	6.56	6.60	1.61	4.37	3.96	0.84	19.71			n	25	24	21	25	21	24	25
Min	161	95	92	36.7	89.9	60.0	5.1	158			Males: adult							
Max	184	120	121	43.3	103.9	73.1	8.8	220			Mean	152	129	128	35.3	77.2	5.50	
n	37	36	33	37	16	36	36	8			SD	3.54			0.78			1.84
Females: adult											Min	149			34.7			75.9
Mean	162	103	103	37.3	91.7	62.7	7.3	171			Max	154	129	128	35.8	78.5		5.5
SD	5.43	5.73	6.87	1.42	3.05	3.10	0.66	14.31			n	2	1	1	2			2
Min	152	93	90	34.3	84.3	55.5	6.2	160			immature							
Max	171	113	115	39.9	96.7	68.6	8.9	188			Mean	150	130	131	35.7	100.7	75.4	5.8
n	40	38	37	39	22	39	39	5			SD	5.45	7.55	8.10	1.26	10.02	7.66	0.73
											Min	145	119	120	34.3	89.2	66.4	4.9
											Max	157	135	137	37.2	107.7	85.1	6.6
											n	4	4	4	4	3	4	4
											Females: adult							
											Mean	145	122	128	33.9	105.6	82.5	6.2
											SD	0.58	2.12	4.24	1.15	1.70	3.04	0.32
											Min	145	120	125	32.6	104.4	80.3	5.8
											Max	146	123	131	34.8	106.8	84.6	6.4
											n	3	2	2	3	2	2	3

TABLE 18 Measurements (mm) and weights (g) of specimens of *Epimachus albertisi*

									E. a. <i>albiventris</i>							
	Wing	Tail	Tail	Tarsus	Total	Bill	Bill	Weight	Males: adult							
	length	length	central	length	head	length	width	length	Mean	159	137	34.0	93.3	71.7	5.10	
									Mean	153	133	34.3	97.5	75.2	5.8	
									SD	7.81	0.58	1.15	1.40	0.42	1.13	
									Min	144	132	132	33.2	97.2	74.4	
									Max	158	133	134	35.9	97.9	76	
									n	3	3	3	2	2	3	
									Females: adult	151	125	128	34.2	63		
									n	1	1	1	1	1		
									all subspecies							
									Males: adult	153	129	129	34.4	98.4	76.1	5.47
									SD	3.45	5.20	6.09	0.89	2.83	2.62	0.60
									Min	145	121	118	32.2	90.3	69.2	4.3
									Max	161	140	141	35.8	103.6	82.6	6.5
									n	51	50	45	49	30	43	12
									subadult	151	126	126	34.49	96.5	75.2	6.0
									SD	2.19	4.76	6.26	0.76	3.60	3.56	0.58
									Min	147	119	116	33.3	94	71.1	5.3
									Max	154	131	134	35.3	102.7	81.2	6.7
									n	7	7	7	7	5	6	6
									immature	151	131	132	34.8	100.3	76.8	5.5
									SD	5.22	5.13	5.06	1.33	5.89	5.13	0.60
									Min	144	119	120	33.2	89.2	66.4	4.9
									Max	158	136	137	37.2	107.7	85.1	6.6
									n	11	11	11	11	8	10	3
									Females: adult	148	124	124	34.0	101.5	79.0	6.1
									SD	2.99	4.33	5.21	0.87	4.74	5.16	1.31
									Min	143	116	115	32.3	91.3	68.1	4.5
									Max	156	134	133	36.5	112.6	91.0	11.0
									n	34	32	28	34	26	31	10
									Females: <i>cervinicauda</i>	152	126	125	34.6	97.6	74.9	5.36
									SD	3.10	3.21	3.60	0.94	2.42	1.99	6.38
									Min	145	121	118	32.2	90.3	69.2	4.3
									Max	159	131	130	35.7	101.7	79.6	6.5
									n	29	29	25	28	21	25	7
									Males: <i>adult</i>	152	126	125	34.8	107.3	84.6	6.1
									SD	2.49	2.30	2.63	1.23	4.57	4.70	0.25
									Min	150	127	127	33.5	104.4	79.2	5.8
									Max	156	133	133	36.5	112.6	91.0	6.5
									n	5	5	4	5	3	5	2
									Females: <i>adult</i>	152	130	131	34.8	107.3	84.6	6.1
									SD	2.49	2.30	2.63	1.23	4.57	4.70	0.25
									Min	150	127	127	33.5	104.4	79.2	5.8
									Max	156	133	133	36.5	112.6	91.0	6.5
									n	5	5	4	5	3	5	2
									Males: <i>adult</i>	152	126	125	34.6	97.6	74.9	5.36
									SD	3.10	3.21	3.60	0.94	2.42	1.99	6.38
									Min	145	121	118	32.2	90.3	69.2	4.3
									Max	159	131	130	35.7	101.7	79.6	6.5
									n	29	29	25	28	21	25	7
									Females: <i>adult</i>	152	126	125	34.6	97.6	74.9	5.36
									SD	3.10	3.21	3.60	0.94	2.42	1.99	6.38
									Min	145	121	118	32.2	90.3	69.2	4.3
									Max	159	131	130	35.7	101.7	79.6	6.5
									n	29	29	25	28	21	25	7

TABLE 19. Measurements (mm) and weights (g) of specimens of *Epimachus bruijnii*

	Wing length	Tail length	Tail central length	Tarsus length	Total head length	Bill length	Bill width	Weight
Males: adult								
Mean	160	110	107	33.0	103.2	79.0	6.27	161
SD	3.07	3.29	3.75	0.93	2.64	2.21	0.54	189
Min	153	103	100	30.8	98.4	73.5	5.3	160
Max	165	116	115	34.8	107.6	82.6	7.3	164
n	28	26	23	26	17	26	27	4
subadult								
Mean	161	112	109	33.1	103.5	78.4	6.3	165
SD	2.06	3.29	2.87	0.73	0.86	1.62	0.67	636
Min	156	104	103	31.7	102.0	74.8	5.6	160
Max	163	115	113	34.1	104.4	80.5	8.1	169
n	18	18	14	18	6	16	16	2
Immature								
Mean	157	115	115	32.0	101.0	75.0	7.2	
SD	6.10	4.51	6.59	0.94	2.91	4.77	0.81	
Min	146	109	108	30.4	95.9	62.4	6.0	
Max	164	128	133	33.5	105.4	80.6	9.1	
n	12	12	11	12	8	12	12	
Females: adult								
Mean	155	111	110	32.1	98.1	75.1	6.8	146
SD	4.78	2.91	2.50	1.21	3.19	3.16	0.91	265
Min	148	107	107	30.2	93	68.3	5.6	144
Max	162	116	115	33.9	102.4	79.1	8.5	149
n	14	14	12	14	6	12	13	3
E. f. atratus								
Males: adult								
Mean	199	391	712	50.1	108.0	77.8	6.72	268
SD	7.65	32.23	63.02	1.90	4.34	3.92	0.65	12.04
Min	188	342	640	47.9	102.3	71.4	5.6	255
Max	214	451	856	54.7	114.8	83.8	8.0	280
n	23	21	18	23	14	19	20	5
subadult								
Mean	197	287	461	50.7	109.0	78.6	6.7	250
SD	9.40	42.50	108.19	2.93	5.50	4.26	0.73	
Min	187	254	384	46.7	101.9	73.4	6.0	
Max	208	346	537	53.5	113.8	82.5	7.4	
n	4	4	2	4	4	4	4	
immature								
Mean	180	250	308	50.4		73.8	6.6	
SD	12.28	5.90	21.88	1.49		6.93	0.65	
Min	164	242	273	48.4		64.8	5.5	
Max	193	255	333	52.3		81.9	7.1	
n	5	5	5	5		5	5	
Females: adult								
Mean	170	215	278	46.8	104.4	76.6	6.8	185
SD	8.45	25.11	31.95	2.63	2.98	2.51	0.58	25.00
Min	154	171	214	42.7	99.5	72.2	5.8	160
Max	187	257	351	53.4	111.2	81.5	8.1	210
n	25	25	17	25	16	25	25	3
E. f. stressemanni								
Males: adult								
Mean	216	458	847	53.8	113.1	82.6	7.42	315
SD	7.11	39.75	56.63	1.42	2.21	1.92	0.52	2.52
Min	206	421	790	51.0	110.6	80.0	6.6	313
Max	232	537	946	55.4	115.9	85.8	8.2	318
n	12	10	9	12	5	12	12	3
subadult								
Mean	185	365	737	51.6		79.4	6.6	
n	1	1	1	1		1	1	
Immature								
Mean	196	267	357	52.2	110.9	80.3	7.8	286
SD	8.43	36.99	51.64	3.18	3.96	2.70	0.52	15.56
Min	179	207	275	45.8	104.7	74.6	6.8	275
Max	205	306	424	56.6	114.6	83.4	8.2	297
n	9	9	8	9	6	9	9	2
Females: adult								
Mean	182	242	322	50.0	109.0	79.4	7.5	237
SD	5.44	15.71	31.87	2.55	1.66	4.51	0.69	26.16
Min	176	230	292	47.3	106.6	71.6	6.0	218
Max	193	280	387	55.0	110.1	88.5	8.3	256
n	11	9	10	11	4	10	11	2
E. f. fastuosus								
Males: adult								
Mean	197	392	710	50.2	105.3	76.5	6.6	266
SD	4.24	37.65	57.05	1.44	2.82	2.06	0.49	11.70
Min	188	340	593	46.6	100.2	72.5	5.9	250
Max	205	539	791	53.5	110.9	80.2	7.6	280
n	24	23	23	23	13	22	23	7
subadult								
Mean	191	274	332	50.67		76.4	6.9	
SD	3.06	20.53	6.11	0.25		1.48	0.23	
Min	188	257	327	50.4		75.1	6.8	
Max	194	297	339	50.9		78	7.2	
n	3	3	3	3		3	3	
immature								
Mean	177	242	304	51.0	103.1	74.5	6.4	222
SD	4.71	10.88	14.52	1.22	5.32	4.97	0.39	17.53
Min	167	226	283	48.8	96.9	67.9	5.7	205
Max	182	257	321	52.5	109.8	81.4	6.8	250
n	8	8	7	8	4	6	8	7
Females: adult								
Mean	166	229	291	47.0	100.1	72.3	6.4	191
SD	10.03	12.48	17.15	2.17	4.28	4.07	0.65	24.74
Min	152	204	270	43.2	95.6	66.4	5.5	160
Max	187	249	321	51.6	104.5	77.4	7.5	235
n	12	11	12	12	5	10	12	7
E. f. ullimus								
Males: adult								
Mean	196	380	725	50.4	101.9	71.7	7.03	278
SD	2.08	7.68	52.08	1.41	0.71	1.36	0.34	3.54
Min	193	374	665	49.1	101.4	69.9	6.6	275
Max	198	391	761	52.4	102.4	73.1	7.3	280
n	4	4	3	4	2	4	4	2
immature								
Mean	183	264	347	50.7	98.3	70.3	6.5	239
SD	5.57	9.93	22.54	1.07	5.94	3.16	0.27	11.51
Min	172	254	320	49.1	94.1	65.7	6.1	223
Max	186	282	382	52.0	102.5	73.7	6.8	252
n	6	6	6	6	2	6	6	6
Females: adult								
Mean	165	235	320	45.6	99.2	70.9	6.5	190
SD	2.63	7.45	15.23	0.64	1.76	1.13	0.37	8.67
Min	161	225	307	44.2	97.0	69.6	6.0	184
Max	168	248	341	46.8	100.7	72.8	7.0	207
n	10	9	8	10	4	10	10	6

TABLE 20. Measurements (mm) and weights (g) of specimens of *Epimachus fastuosus*

	Wing length	Tail length	Tail central length	Tarsus length	Total head length	Bill length	Bill width	Weight
E. f. fastuosus								
Males: adult								
Mean	197	392	710	50.2	105.3	76.5	6.6	266
SD	4.24	37.65	57.05	1.44	2.82	2.06	0.49	11.70
Min	188	340	593	46.6	100.2	72.5	5.9	250
Max	205	539	791	53.5	110.9	80.2	7.6	280
n	24	23	23	23	13	22	23	7
subadult								
Mean	191	274	332	50.67		76.4	6.9	
SD	3.06	20.53	6.11	0.25		1.48	0.23	
Min	188	257	327	50.4		75.1	6.8	
Max	194	297	339	50.9		78	7.2	
n	3	3	3	3		3	3	
immature								
Mean	177	242	304	51.0	103.1	74.5	6.4	222
SD	4.71	10.88	14.52	1.22	5.32	4.97	0.39	17.53
Min	167	226	283	48.8	96.9	67.9	5.7	205
Max	182	257	321	52.5	109.8	81.4	6.8	250
n	8	8	7	8	4	6	8	7
Females: adult								
Mean	166	229	291	47.0	100.1	72.3	6.4	191
SD	10.03	12.48	17.15	2.17	4.28	4.07	0.65	24.74
Min	152	204	270	43.2	95.6	66.4	5.5	160
Max	187	249	321	51.6	104.5	77.4	7.5	235
n	12	11	12	12	5	10	12	7

all subspecies									immature							
Males: adult									Mean	168	204	327	47.7	110.7	85.5	6.4
Mean	201	402	735	50.9	107.4	77.9	6.83	277	SD	3.43	20.55	32.18	5.03	4.91	5.14	0.48
SD	9.70	42.82	76.98	2.14	4.42	3.96	0.62	21.11	Min	162	171	280	37.9	105.9	77.3	5.8
Min	188	340	593	46.5	100.2	69.9	5.6	250	Max	171	232	370	51.8	115.7	89.5	7
Max	232	539	946	55.4	115.9	85.8	8.2	318	n	6	6	5	6	3	5	6
n	63	58	53	62	34	57	59	17	Females: adult							
subadult									Mean	153	193	275	44.9	111.2	83.1	6.3
Mean	193	292	443	50.8	109.0	77.9	6.8	250	SD	6.78	24.88	39.22	2.10	5.96	5.19	0.52
SD	7.61	42.47	164.66	1.95	5.50	3.16	0.51		Min	142	151	213	39.0	95.6	69.1	5.7
Min	185	254	327	46.7	101.9	73.4	6.0		Max	170	225	331	47.0	117.2	88.4	7.4
Max	208	365	737	53.5	113.8	82.5	7.4		n	16	15	9	16	13	15	4
n	8	8	6	8	4	8	8	1								
immature									<i>E. m. megarhynchus</i>							
Males: immature									Mean	166	229	250	50.7	82.2	6.3	
Mean	179	256	331	51.2	106.2	75.4	6.9	237	n	1	1	1	1	1	1	
SD	36.67	24.10	39.46	2.11	6.70	5.70	0.76	25.52	Females: adult							
Min	0	207	273	45.8	94.1	64.8	5.5	205	Mean	154	221	304	44.2	110.3	80.9	6.8
Max	205	306	424	56.6	114.6	83.4	8.2	297	SD	0.00	38.89	63.64	0.07	2.55	0.78	
n	28	28	26	28	12	26	28	15	Min	154	193	259	44.1	79.1	6.2	
Females: adult									Max	154	248	349	44.2	110.3	82.7	7.3
Mean	171	226	298	47.2	103.6	75.3	6.8	195	n	2	2	2	2	1	2	
SD	9.52	21.98	32.05	2.68	4.17	4.28	0.68	24.26								
Min	152	171	214	42.7	95.6	66.4	5.5	160								
Max	193	280	387	55.0	111.2	88.5	8.3	255								
n	58	54	47	58	29	55	58	18								
E. m. bladdi									Males: adult							
									Mean	177	237	670	48.7	112.9	84.4	6.57
									SD	2.92	10.58	51.06	1.20	1.43	1.93	0.68
									Min	171	218	595	46.3	110.1	81.7	5.5
									Max	181	264	766	50.5	114.4	88.5	7.5
									n	16	16	16	16	8	13	6
									subadult							
									Mean	172	215	437	49.1		86.9	6.4
									SD	5.20	7.00		2.55		1.21	0.76
									Min	169	210		46.5		85.8	5.6
									Max	178	223		51.6		88.2	7.1
									n	3	3	1	3		3	2
									immature							
									Mean	162	219	324	48.0	102.5	79.8	6.4
									SD	5.73	12.87	13.06	1.57	9.62	6.10	0.49
									Min	151	194	306	45.7	95.7	68.4	5.4
									Max	169	235	348	49.6	109.3	86.9	7.1
									n	9	9	7	9	2	8	2
									Females: adult							
									Mean	153	197	288	44.9	108.0	81.8	6.2
									SD	4.16	12.89	23.22	1.93	3.45	2.49	0.50
									Min	144	171	262	41.3	103.1	78.2	5.3
									Max	165	226	341	49.8	115.8	88.7	7.3
									n	23	20	18	23	11	23	4
E. m. meyeri									Males: adult							
									Mean	182	252	706	50.2	114.6	84.4	6.68
									SD	6.69	16.79	75.66	1.78	2.79	2.72	0.59
									Min	171	218	522	46.3	109.8	78.4	5.5
									Max	206	282	822	54.0	119.9	90.4	7.9
									n	51	50	42	50	33	42	14
									subadult							
									Mean	178	237	463	50.39	116.0	86.7	6.9
									SD	7.18	26.42	168.28	1.69	3.62	2.63	0.52
									Min	169	205	308	46.5	112.1	81.4	5.6
									Max	186	276	741	51.9	120.5	88.9	7.3
									n	9	9	5	9	5	9	3
									immature							
									Mean	169	215	329	49.7	110.5	83.1	6.7
									SD	8.43	19.57	30.18	3.19	6.88	5.05	0.62
									Min	150	171	250	37.9	95.7	68.4	5.4
									Max	184	260	372	53.9	121.8	91.7	7.9
									n	35	34	31	35	14	31	6
									Females: adult							
									Mean	157	201	294	45.5	110.3	81.8	6.5
									SD	9.47	20.48	32.37	2.77	5.76	4.63	0.64
									Min	142	151	213	39.0	95.5	65.6	5.3
									Max	185	250	359	53.2	120.3	90.5	8.3
									n	65	61	50	65	41	62	14
									Males: adult							
									Mean	177	247	574	49.5	116.8	85.2	7.02
									SD	6.57	14.40	71.86	0.79	1.82	2.37	0.76
									Min	171	234	522	48.3	114.8	82.3	6.2
									Max	188	265	656	50.1	118.4	87.2	7.9
									n	5	5	3	4	3	4	1
									subadult							
									Mean	172	237	463	50.39	116.0	86.7	6.9
									SD	7.18	26.42	168.28	1.69	3.62	2.63	0.52
									Min	169	205	308	46.5	112.1	81.4	5.6
									Max	186	276	741	51.9	120.5	88.9	7.3
									n	9	9	5	9	5	9	3
									immature							
									Mean	169	215	329	49.7	110.5	83.1	6.7
									SD	8.43	19.57	30.18	3.19	6.88	5.05	0.62
									Min	150	171	250	37.9	95.7	68.4	5.4
									Max	184	260	372	53.9	121.8	91.7	7.9
									n	35	34	31	35	14	31	6
									Females: adult							
									Mean	157	201	294	45.5	110.3	81.8	6.5
									SD	9.47	20.48	32.37	2.77	5.76	4.63	0.64
									Min	142	151	213	39.0	95.5	65.6	5.3
									Max	185	250	359	53.2	120.3	90.5	8.3
									n	65	61	50	65	41	62	14
									Males: adult							
									Mean	180	217	502	44.2	108.0	81.1	
									SD	4.77	24.60	56.94	1.38	1.73	1.90	0.28
									Min	162	142	343	39.3	63.0	34.2	5.0
									Max	180	231	519	44.2	115.7	89.5	7.23
									n	11	11	10	11	7	11	8
									immature							
									Mean	162	203	352	42.2	65.3	38.6	

TABLE 22. Measurements (mm) and weights (g) of specimens of *Astrapia nigra*

	Wing length	Tail length	Tail central length	Tarsus length	Total length	Bill head length	Bill width	Weight
Males: adult								
Mean	185	399	569	41.7	69.4	41.4	6.4	
SD	320	16.16	45.73	0.92		0.76	0.36	
Min	179	369	518	39.0		40.1	5.9	
Max	193	437	756	43.3		42.4	7.0	
n	25	24	23	25	1	22	24	
subadult								
Mean	182	291	361	42.2	69.5	41.7	6.5	
SD	2.04	28.47	23.02	1.47		1.18	0.39	
Min	179	273	335	39.8		40.3	6.1	
Max	185	341	398	43.8		43.8	7.2	
n	6	5	5	6	1	6	6	
immature								
Mean	177	266	327	41.7	70.1	41.2	6.5	190
SD	2.64	22.79	29.44	0.63	1.91	1.63	0.39	
Min	173	239	299	40.7	69.0	38.3	6.0	
Max	180	303	377	42.5	72.3	43.1	6.9	
n	6	6	6	6	3	6	6	1
Females: adult								
Mean	170	258	310	40.0	67.6	41.2	6.8	
SD	8.35	11.91	14.69	2.02	1.67	0.99	0.30	
Min	157	233	290	37.2	65.9	39.2	6.1	
Max	182	274	332	43.4	69.9	42.7	7.2	
n	17	15	14	17	4	17	17	

TABLE 23. Measurements (mm) and weights (g) of specimens of *Astrapia splendidissima*

	Wing length	Tail length	Tail central length	Tarsus length	Total length	Bill head length	Bill width	Weight
Males: adult								
Mean	134	161	203	37.2	65.5	39.7	6.5	
SD	1.75	6.07	5.22	0.77	0.72	1.35	0.51	
Min	131	148	193	35.3	64.7	37.7	5.6	
Max	137	175	213	38.5	66.1	42.4	7.3	
n	16	15	11	16	3	15	16	
subadult								
Mean	135	159	201	37.9	64.0	38.2	6.2	
SD	2.12	24.04	8.49	0.35		0.14	0.85	
Min	133	142	195	37.6		38.1	5.6	
Max	135	176	207	38.1		38.3	6.8	
n	2	2	2	2	1	2	2	
immature								
Mean	135	176	206	36.5	64.3	39.6	6.5	
SD	2.76	10.20	18.61	0.94	2.90	1.01	0.26	
Min	132	162	181	35.2	62.2	38.9	6.1	
Max	139	192	233	37.6	66.3	41.8	6.9	
n	7	6	5	7	2	7	7	
Females: adult								
Mean	132	176	204	36.3	64.4	39.2	6.8	120
SD	2.43	12.34	12.45	1.15	1.36	1.30	0.40	
Min	128	166	189	32.7	62.2	36.5	5.9	
Max	136	204	232	38.8	66.0	41.2	7.5	
n	21	19	20	21	7	21	21	1

	<i>A. s. helios</i>								
Males: adult									
Mean	138	178	218	37.7	66.8	40.0	6.5	139	
SD	2.94	21.45	14.06	1.45	0.97	0.97	0.45	10.42	
Min	133	131	199	34.4	65.4	38.2	5.5	120	
Max	145	201	243	39.9	68.9	42.5	7.5	149	
n	22	18	18	22	13	21	21	6	
subadult									
Mean	140	188	216	38.6	65.2	39.8	6.2	138	
SD	1.79	5.57	17.93	1.53	0.28	0.39	0.49	17.68	
Min	137	182	205	37.0	65.0	39.4	5.7	125	
Max	142	195	237	40.2	65.4	40.3	6.9	150	
n	5	4	3	5	2	4	5	2	
immature									
Mean	143	200	231	38.0	64.9	39.5	6.5	130	
SD	2.69	14.02	13.16	1.39	0.95	1.41	0.28	5.62	
Min	133	165	213	35.2	63.0	36.1	6.0	125	
Max	147	222	251	40.6	66.1	41.7	7.2	138	
n	23	23	18	23	10	22	23	6	
Females: adult									
Mean	137	189	212	36.8	66.3	40.3	6.6	126	
SD	3.21	8.88	9.03	0.91	1.05	1.35	0.38	12.85	
Min	130	173	203	34.7	64.1	36.3	5.7	114	
Max	145	208	236	38.8	68.6	42.5	7.5	151	
n	31	29	24	31	14	30	29	8	
	<i>A. s. elliotsmithi</i>								
Males: adult									
Mean	139	199	235	38.4	66.7	41.2	6.3	137	
SD	2.43	6.89	7.78	1.40	1.53	1.28	0.31	8.85	
Min	136	189	225	35.7	65.0	38.9	6.0	124	
Max	142	207	243	39.8	67.9	43.2	6.7	151	
n	8	5	7	8	3	7	8	6	
immature									
Mean	139	197	226	38.7	65.5	40.1	6.1	135	
SD	3.30	10.89	10.68	0.98	0.64	0.94	0.17	3.30	
Min	136	182	213	37.9	65.0	39.1	5.8	131	
Max	143	206	237	40.1	65.9	41.3	6.2	139	
n	4	4	4	4	2	4	4	4	
Females: adult									
Mean	136	200	224	38.0	64.2	40.3	6.5	125	
SD	2.98	12.01	14.39	0.88		0.72	0.38	7.54	
Min	132	187	209	36.7			38.9	6.1	108
Max	140	224	249	39.5			41.2	7.2	133
n	10	10	10	10	1	10	9	8	
	all subspecies								
Males: adult									
Mean	137	174	217	37.7	66.6	40.1	6.5	138	
SD	3.21	19.61	15.50	1.29	1.08	1.25	0.45	9.34	
Min	131	131	193	34.4	64.7	37.7	5.5	120	
Max	145	207	243	39.9	68.9	43.2	7.5	151	
n	46	38	36	46	19	43	45	12	
subadult									
Mean	138	178	210	38.4	64.8	39.27	6.2	138	
SD	3.09	18.73	15.79	1.31	0.72	0.88	0.53	17.68	
Min	133	142	195	37.0	64.0	38.1	5.6	125	
Max	142	195	237	40.2	65.4	40.3	6.9	150	
n	7	6	5	7	3	6	7	2.0	
immature									
Mean	141	195	225	37.8	64.9	39.6	6.5	132	
SD	4.10	15.81	16.39	1.40	1.19	1.27	0.29	5.22	
Min	132	162	181	35.2	62.2	36.1	5.8	125	
Max	147	222	251	40.6	66.3	41.8	7.2	139	
n	34	33	27	34	14	33	34	10	
Females: adult									
Mean	135	187	211	36.8	65.6	39.9	6.7	125	
SD	3.56	13.34	13.47	1.14	1.45	1.37	0.40	9.97	
Min	128	166	197	32.7	62.2	36.3	5.7	108	
Max	145	224	249	39.5	68.6	42.5	7.5	151	
n	62	58	54	62	22	61	59	17	

TABLE 24. Measurements (mm) and weights (g) of specimens of *Astrapia mayri*

	Wing	Tail	Tail	Tarsus	Total	Bill	Bill	Weight	A. s. <i>feminina</i>							
	length	length	length	central	length	head	length	width	Mean	166	154	727	40.95	35	5.1	150
Males: adult									Mean	166	154	727	40.95	35	5.1	150
Mean	179	111	893	40.9	61.1	33.1	4.7	147	SD	4.95	44.55	0.64	1.84	0.21		
SD	2.74	6.55	81.76	1.73	1.37	1.49	0.29	10.52	Min	162	122	40.5	33.7	4.9		
Min	173	97	657	37.6	58.8	28.5	4.1	134	Max	169	185	41.4	36.3	5.2		
Max	185	120	1017	43.2	63.6	35.0	5.2	164	n	2	2	1	2	2		
n	30	29	26	29	14	25	23	12						2	2	1
subadult									subadult							
Mean	173	155	377	41.4	61.7	33.8	5.0	155	Mean	166	191	398	42.8	37.9	5.4	147
SD	4.77	15.27	61.80	1.65	0.66	1.11	0.29	7.07	SD	2.12	21.12	31.82	1.63	0.78	0.00	11.31
Min	163	118	296	36.7	60.8	31.3	4.5	150	Min	164	189	375	41.6	37.3	5.4	139
Max	181	176	580	43.3	62.2	36.9	5.5	160	Max	167	192	420	43.9	38.4	5.4	155
n	20	19	19	20	5	19	19	2	n	2	2	2	2	2	2	2
immature									immature							
Mean	165	162	300	40.8	60.4	33.2	5.1	148	Mean	162	180	370	40.6	63.4	35.8	160
SD	5.70	16.66	72.15	1.39	1.26	1.09	0.26	5.22	SD	2.50	21.52	46.79	1.41	1.56	0.29	3.5
Min	156	134	153	39.4	59.2	31.4	4.7	143	Min	158	148	323	37.5	62.3	33.3	5.0
Max	175	175	380	43.1	62.5	34.8	5.5	159	Max	165	201	467	41.9	64.5	36.9	164
n	10	8	10	10	8	10	9	5	n	4	7	7	9	2	9	3
Females: adult									Females: adult							
Mean	156	152	309	39.4	60.9	33.0	5.0	132	Mean	152	190	316	40.0	64.0	36.5	135
SD	3.81	14.52	24.69	1.20	1.07	0.77	0.27	19.96	SD	6.16	19.54	31.45	1.28	1.30	0.88	4.24
Min	150	122	260	36.4	58.8	31.4	4.4	102	Min	144	151	274	38.2	62.9	34.8	132
Max	163	178	374	41.6	62.1	34.9	5.4	157	Max	165	208	357	42.6	66.1	37.9	138
n	27	24	24	27	11	25	25	7	n	9	7	7	9	5	9	2

TABLE 25. Measurements (mm) and weights (g) of specimens of *Astrapia stephaniae*

	Wing	Tail	Tail	Tarsus	Total	Bill	Bill	Weight	A. s. <i>stephaniae</i>								
	length	length	length	central	length	head	length	width	Mean	166	129	628	41.6	64.3	36.6	5.3	150
Males: adult									Males: adult								
Mean	171	154	640	41.9	66.6	38.6	5.4	160	Mean	166	129	628	41.6	64.3	36.6	5.3	150
SD	5.02	11.85	34.15	1.40	1.60	1.74	0.29	11.38	SD	3.89	14.22	37.76	1.64	1.27	1.57	0.34	4.50
Min	160	132	574	37.6	64.0	33.8	4.6	144	Min	156	107	565	37.6	62.5	34.1	4.7	145
Max	182	182	693	45.4	69.8	41.4	5.8	169	Max	173	158	691	43.8	66.4	40.0	5.8	156
n	32	27	20	30	18	26	26	4	n	24	20	20	12	24	23	4	
subadult									subadult								
Mean	171	199	396	42.5	65.8	38.2	5.5		Mean	166	178	436	41.5	64.2	35.3	5.2	153
SD	4.74	19.32	48.65	1.34	1.87	1.71	0.29		SD	3.39	32.73	77.49	1.33	1.01	0.76	0.20	4.62
Min	163	147	343	39.8	63.4	35.7	5.1		Min	162	142	357	39.3	63.0	34.2	5.0	150
Max	180	211	502	44.2	68.6	41.3	6.1		Max	171	231	519	43	66.2	36.1	5.5	158
n	11	11	10	11	7	11	8		n	6	6	5	6	4	6	6	3
immature									immature								
Mean	162	203	352	42.2	65.3	38.6	5.6	164	Mean	158	196	322	41.8	64.4	36.7	5.3	144
SD	5.93	25.57	18.36	1.17	1.64	1.43	0.36		SD	3.25	16.79	27.77	1.69	1.31	1.52	0.29	11.1
Min	153	146	316	40.2	63.5	35.9	4.9		Min	152	158	246	39.3	61.6	33.2	4.8	130
Max	179	247	390	43.9	67.3	42.3	6.2		Max	163	225	351	46.5	66.4	39	5.9	157
n	19	18	16	19	8	18	18	1	n	16	16	13	16	12	16	16	7
Females: adult									Females: adult								
Mean	156	201	328	40.4	65.3	38.3	5.7	148	Mean	152	185	317	39.4	65.0	37.1	5.6	134
SD	4.38	14.90	20.94	1.49	1.35	1.22	0.32	8.96	SD	3.61	11.45	21.14	1.35	2.04	1.50	0.37	7.65
Min	145	170	279	36.3	63.0	36.4	4.9	139	Min	144	217	368	37.0	59.2	34.1	4.7	123
Max	165	230	358	43.1	67.5	41.9	6.2	159	Max	159	217	362	41.9	67.3	40.1	6.5	148
n	34	30	30	34	22	34	32	4	n	30	26	26	29	17	28	29	13
all subspecies									Males: adult								
Mean	169	144	637	41.8	65.7	37.5	5.3	155	Mean	169	144	637	41.8	65.7	37.5	5.3	155
SD	5.17	18.97	38.45	1.49	1.84	1.96	0.31		SD	5.17	18.97	38.45	1.49	1.84	1.96	0.31	9.18
Min	156	107	565	37.6	62.5	33.7	4.6		Min	156	107	565	37.6	62.5	33.7	4.6	144
Max	182	185	727	45.4	69.5	41.4	5.8		Max	182	185	727	45.4	69.5	41.4	5.8	169
n	58	49	41	56	36	30	52	51	n	58	49	41	56	36	30	51	9
subadult									subadult								
Mean	168	192	408	42.2	65.2	37.2	5.4	150	Mean	168	192	408	42.2	65.2	37.2	5.4	150
SD	4.77	24.60	56.94	1.36	1.73	1.90	0.28		SD	4.77	24.60	56.94	1.36	1.73	1.90	0.28	7.23
Min	162	142	343	39.3	63.0	34.2	5.0		Min	162	142	343	39.3	63.0	34.2	5.0	137
Max	180	231	519	44.2	68.6	41.3	6.1		Max	180	231	519	44.2	68.6	41.3	6.1	168
n	19	19	17	19	11	19	16	5	n	19	19	17	19	11	16	16	5
immature									immature								
Mean	160	196	345	41.8	64.6	37.3	5.5	150	Mean	160	196	345	41.8	64.6	37.3	5.5	150
SD	4.93	22.80	33.59	1.52	1.51	1.80	0.35		SD	4.93	22.80	33.59	1.52	1.51	1.80	0.35	12.3
Min	152	146	246	37.5	61.6	33.2	4.8		Min	152	146	246	37.5	61.6	33.2	4.8	130
Max	179	247	467	46.5	67.3	42.3	6.2		Max	179	247	467	46.5	67.3	42.3	6.2	164
n	44	41	36	44	22	43	43	11	n	44	41	36	44	22	43	43	11
Females: adult									Females: adult								
Mean	154	193	322	40.0	65.1	37.6	5.7	137	Mean	154	193	322	40.0	65.1	37.6	5.7	137
SD	4.68	15.89	22.62	1.47	1.66	1.46	0.34		SD	4.68	15.89	22.62	1.47	1.66	1.46	0.34	9.47
Min	144.0	151.0	268	36.3	59.9	34.1	4.7		Min	144.0	151.0	268	36.3	59.9	34.1	4.7	123
Max	165	230	362	43.1	67.5	41.9	6.5		Max	165	230	362	43.1	67.5	41.9	6.5	159
n	73	63	63	72	44	71	70	19	n	73	63	63	72	44	71	70	19

Males: adult	Males: adult								Males: subadult							
	Mean	185	399	569	41.7	69.4	41.4	6.4	Mean	145	261	243	37.7	60.9	42.8	7.6
	SD	3.20	16.16	45.73	0.92		0.76	0.36	SD	22	18	18	22	13	21	6
	Min	179	369	518	39.0		40.1	5.9	Min	140	188	216	38.6	65.2	39.8	6.2
subadult									SD	1.79	5.57	17.93	1.53	0.28	0.39	0.49
Mean									Min	120	80	82	28.1	53.4	27.7	4.6
SD									Max	140	92	94	33.3	58.5	33.5	6.2
Min									n	33	33	32	32	13	31	8

TABLE 26. Measurements (mm) and weights (g) of specimens of *Astrapia Rothschildi*

	Wing	Tail	Tail	Tarsus	Total	Bill	Bill	Weight
	length	length	central	length	head	length	width	
length								
Males: adult								
Mean	188	352	443	41.8	67.1	39.2	6.7	207
SD	3.35	30.02	33.19	1.38	1.62	1.04	0.40	17.46
Min	182	271	367	38.0	65.0	37.2	5.5	186
Max	194	387	486	44.1	71.8	40.8	7.2	225
n	25	20	16	26	15	24	23	5
subadult								
Mean	178	227	270	42.3	65.6	38.0	6.2	
SD	0.00	14.14	6.36	0.85	0.85	1.77		
Min	178	217	265	41.7	65.0	36.7		
Max	178	237	274	42.9	66.2	39.2		
n	2	2	2	2	2	2		1
Immature								
Mean	169	225	255	41.4	64.6	39.1	7.3	197
SD	8.62	16.68	27.67	1.37		0.75	0.59	2.8
Min	158	202	231	39.2		38.1	6.7	195
Max	176	241	283	42.7		39.9	8	199
n	4	4	4	5	1	4	5	2
Females: adult								
Mean	164	220	256	40.1	65.2	39.3	6.9	169
SD	8	8	11	1.23	1.28	1.28	0.30	17.97
Min	152	208	240	38.6	62.4	36.5	6.1	143
Max	180	233	283	43.5	66.9	41.2	7.5	200
n	21	19	16	20	11	21	21	9

Males: adult	Males: adult								Males: subadult							
	Mean	132	85	88	31.5	55.5	30.0	5.2	83							
	SD	3.43	2.95	3.33	1.02	1.56	1.30	0.31	5.08							
	Min	126	80	82	28.1	53.4	27.7	4.6	77							
subadult									Max	140	92	94	33.3	58.5	33.5	6.2
Mean									n	33	33	32	32	13	31	8
subadult									Mean	130	85	87	31.5	54.8	29.5	5.4
Mean									SD	2.29	3.01	2.76	1.26	1.12	1.02	0.32
SD									Min	126	80	81	28.8	52.6	28.6	5.0
Min									Max	134	89	92	33.6	55.8	32.1	6.1
Max									n	12	12	12	12	7	12	1
immature									Mean	122	85	87	31.3	55.1	29.6	5.3
Mean									SD	4.53	4.34	4.90	1.09	0.56	0.43	0.28
SD									Min	117	77	77	29.1	54.2	29.1	4.8
Min									Max	131	91	92	32.6	55.8	30.5	5.8
Max									n	14	13	13	14	8	13	4
Females: adult									Mean	116	80	81	28.7	53.6	29.2	5.3
Mean									SD	3.85	3.81	4.03	1.37	1.34	1.18	0.24
SD									Min	110	71	73	26.6	50.9	27.5	4.7
Min									Max	126	88	91	32.1	55.5	31.3	5.7
Max									n	24	23	21	24	17	24	5

TABLE 27. Measurements (mm) and weights (g) of specimens of *Lophorina superba*

	Wing	Tail	Tail	Tarsus	Total	Bill	Bill	Weight
	length	length	central	length	head	length	width	
length								
Males: adult								
Mean	140	99	102	31.2	56.5	30.2	5.2	90
SD	3.57	2.60	3.17	1.06	0.83	0.97	0.46	4.60
Min	131	93	97	28.0	55.3	28.2	4.4	81
Max	149	104	109	32.6	57.9	32.5	6.2	95
n	24	23	20	23	12	23	23	8
subadult								
Mean	139	102	104	31.4		30.8	5.8	
SD	1.53	2.00	2.12	0.49		0.36	0.10	
Min	138	100	102	31.1		30.4	5.7	
Max	141	104	105	32.0		31.1	5.9	
n	3	3	2	3		3	3	
Immature								
Mean	134	101	104	31.2	56.7	29.7	5.5	
SD	2.30	2.12	2.14	0.47	0.92	0.56	0.57	
Min	129	98	101	30.6	56.0	28.9	4.9	
Max	135	104	107	31.7	57.3	30.4	6.3	
n	7	7	7	7	2	7	6	
Females: adult								
Mean	126	96	98	30.0	55.5	30.2	5.6	74
SD	3.17	3.36	4.27	1.11	0.94	1.39	0.47	7.12
Min	122	90	93	28.3	54.4	26.2	4.9	68
Max	133	103	110	32.0	57.0	32.1	6.8	85
n	16	16	16	16	7	16	15	5

Males: adult	Males: adult								Males: subadult							
	Mean	139	87	88	32.4	56.2	30.7	5.4	81							
	SD	2.95	3.47	3.37	1.11	0.88	0.90	0.26	13.16							
	Min	134	82	83	29.7	54.5	28.7	4.8	60							
subadult									Max	146	99	99	34.3	57.7	32.5	5.8
Mean									n	27	27	26	26	12	28	5
subadult									Mean	139	84	85	33.1		31.0	5.8
Mean									SD	2.16	2.45	1.53	1.28		0.26	0.14
SD									Min	137	81	83	32.0		30.6	5.7
Min									Max	142	86	85	34.9		31.2	6.0
Max									n	4	4	3	4		4	4
immature									Mean	131	85	84	31.9	56.1	30.4	5.7
Mean									SD	4.60	5.56	4.52	1.25	1.06	0.76	0.36
SD									Min	120	77.9	76.6	30.2	54.7	28.9	5.0
Min									Max	134	99	92	34.0	57.6	31.1	6.1
Max									n	11	10	8	11	5	11	10

Females: adult										Females: adult									
Mean	122	80	80.5	29.9	55.0	31	5.7	63		Mean	121	81	81	30.0	54.6	29.4	5.4	67	
SD	3.26	3.28	3.99	0.91	2.03	1.12	0.44	12.02		SD	4.59	2.32	2.81	1.64	1.50	0.98	0.21	5.42	
Min	115	73	72	28.6	52.3	28.7	4.9	54		Min	114	76	75	27.8	52.4	27.7	4.8	58	
Max	127	87	88	31.6	58.4	32.9	6.6	71		Max	131	85	88	36.5	57.5	31.4	5.8	78	
n	18	18	18	18	8	18	17	2		n	29	29	29	29	10	29	29	13	
<i>L. s. niedda</i>										all subspecies									
Males: adult										Males: adult									
Mean	139	100	101	30.4	58.2	30.9	5.4	103		Mean	136	90	92	31.8	56.1	30.1	5.3	87	
SD	2.22	2.89	3.30	1.59	0.49	0.31	0.40	3.54		SD	4.52	5.76	6.12	1.15	1.16	1.11	0.35	6.76	
Min	137	97	98	28.2	57.8	30.5	5.0	100		Min	126	80	81.9	26.0	53.4	27.7	4.4	60	
Max	142	102	105	31.7	58.5	31.2	5.8	105		Max	149	104	109	34.6	58.5	33.5	6.2	106	
n	4	4	4	4	2	4	3	2		n	148	147	138	145	53	146	144	62	
Females: adult										subadult									
Mean	124	100	102	30.4	55.9	30.6	5.5	71		Mean	134	88	89	31.9	55.4	29.9	5.5	78	
SD	0.71	3.54	4.24	0.42	0.21	0.21	0.07	0.71		SD	4.52	6.54	5.61	1.15	1.28	1.07	0.35	5.71	
Min	123	97	99	30.1	55.7	30.4	5.4	70		Min	125	80	81	28.8	52.6	28.4	5.0	72	
Max	124	102	105	30.7	56.1	30.7	5.5	71		Max	142	104	106	34.9	57.7	32.1	6.1	87	
n	2	2	2	2	2	2	2	2		n	26	26	24	26	11	26	26	6	
<i>L. s. connectens</i>										immature									
Males: adult										Mean	128	87	89	31.6	55.3	29.7	5.4	76.2	
Mean	137	88	91	31.9	55.9	29.9	5.1	87		SD	5.46	6.32	6.96	1.15	1.24	0.89	0.37	6.58	
SD	3.65	2.27	2.86	0.66	0.58	0.66	0.40	4.96		Min	117	77	76.6	28.8	52.6	27.8	4.7	64	
Min	128	85	85	30.8	55.3	29.0	4.6	79		Max	137	104	107	34.7	57.6	31.7	6.3	86	
Max	144	92	96	33.0	56.7	30.9	6.0	99		n	58	56	53	58	26	54	52	17	
subadult										Females: adult									
Mean	133	92	88	31.4	55.6	29.5	5.2	77		Mean	120	83	84	29.7	54.4	29.7	5.5	67	
SD	0.71	9.19	2.83	0.07		0.57	0.07	0.71		SD	4.96	6.50	7.33	1.43	1.60	1.19	0.36	5.77	
Min	132	85	86	31.3		29.1	5.1	76		Min	110	71	72	26.6	50.9	26.2	4.7	54	
Max	133	98	90	31.4		29.9	5.2	77		Max	133	103	110	36.5	58.4	32.9	6.8	85	
n	2	2	2	2	1	2	2	2		n	117	115	113	115	63	117	115	52	
immature																			
Mean	127	86	87	31.7	55.2	29.4	5.2	77											
SD	3.21	1.53	1.53	1.17	0.92	0.95	0.32	8.50											
Min	123	84	85	30.4	54.5	28.8	4.8	64											
Max	129	87	88	32.6	55.8	30.5	5.4	63											
n	3	3	3	3	2	3	3	4											
Females: adult																			
Mean	118	81	82	30.2	54.2	29.9	5.4	66											
SD	4.25	3.64	4.04	1.88	1.38	0.98	0.36	3.92											
Min	110	77	76	28.5	51.7	28.6	5.0	61											
Max	126	86	88	35.3	56.9	32.0	6.2	77											
n	12	12	12	11	11	12	12	16											
<i>L. s. sphinx</i>										Males: adult									
Males: immature										Mean	161	187	213	50.9	59.6	30.8	6.6	171	
Mean	137	91	96	31.7		28.2	5.0			SD	2.66	8.93	6.91	1.41	2.08	1.13	0.46	115	
n	1	1	1	1		1	1			Min	157	159	201	48.5	56.4	28.8	5.6	170	
<i>L. s. addenda</i>										Max	166	198	225	53.2	62.0	32.7	7.3	172	
Males: adult										subadult									
Mean	136	87	89	31.6	55.7	30.1	5.3	87		Mean	160	161	182	52.1	59.7	31.4	6.7		
SD	4.20	2.79	3.41	1.21	0.75	1.19	0.33	6.13		SD	1.00	11.93	2.00	0.70		1.85	0.06		
Min	127	81	81.9	29.1	55.0	28.4	4.6	78		Min	159	148	180	51.4		29.3	6.7		
Max	145	93	96	33.5	56.5	32.7	5.9	95		Max	161	171	184	52.8		32.8	6.8		
n	26	26	25	26	3	26	26	10		n	3	3	3	3	1	3	3		
subadult										immature									
Mean	136	91	92	32.15	56.6	30.0	5.1	79		Mean	157	161	175	48.9	61.5	31.9	6.7	176	
SD	7.78	4.24	4.95	0.35	1.56	1.20	0.00	6.36		SD	2.87	10.34	6.29	3.06	1.73	1.10	0.58		
Min	130	88	88	31.9	55.5	29.1	5.1	74		Min	152	140	165	42.8	59.3	30.7	6.2		
Max	141	94	95	32.4	57.7	30.8	5.1	83		Max	161	172	184	51.7	63.5	32.9	7.5		
n	2	2	2	2	2	2	2	2		n	8	7	7	8	4	4	4	1	
immature										Females: adult									
Mean	128	86	87	31.9	54.9	29.6	5.3	78		Mean	149	153	166	46.3	60.7	31.1	7.1	148	
SD	4.12	3.00	2.99	1.29	1.78	1.04	0.32	5.29		SD	3.83	5.80	3.60	2.41	1.09	1.23	0.52	350	
Min	119	80	82	28.8	52.6	27.8	4.7	70		Min	142	140	161	43.5	59.1	27.6	6.1	144	
Max	135	91	93	34.7	57.3	31.7	5.9	86		Max	157	164	175	52.1	62.4	33.3	7.8	154	
n	19	19	18	19	7	18	18	8		n	20	19	17	20	11	19	19	7	

TABLE 28. Measurements (mm) and weights (g) of specimens of *Parotia walmei*

TABLE 29. Measurements (mm) and weights (g) of specimens of *Parotia setifera*

	Wing length	Tail length	Tail central length	Tarsus length	Total length	Bill head length	Bill width	Weight	subadult	Mean	152	92	85	49.25	61.1	33.0	6.8								
Males: adult																									
Mean	166	128	130	52.8	67.1	35.3	5.7	192	Mean	152	92	85	49.25	61.1	33.0	6.8									
SD	2.41	2.84	3.27	1.63	1.34	1.93	0.37	10.30	SD	2.83	5.66	0.35	0.64	0.14											
Min	161	123	125	49.9	64.0	30.4	5.0	175	Min	90	81	49		32.5	6.7										
Max	170	133	137	56.6	68.9	39.5	6.4	205	Max	94	89	49.5		33.4	6.9										
n	32	30	29	31	14	31	24	12	n	1	2	2	1	2	2										
subadult																									
Mean	165	131	133	52.2	67.2	36.1	6.1	202	<i>P. c. meeki</i>																
SD	1.75	3.49	4.41	2.78	1.45	0.88	0.44	7.6	Mean	153	76	75	50.8		37.9	6.7									
Min	162	126	125	43.9	65.6	34.2	5.4	195	SD	1.50	2.16	1.26	0.66	1.48	0.30										
Max	168	139	142	55.1	69.6	37.5	6.9	210	Min	151	73	73	50.0		36.8	6.4									
n	15	15	14	15	7	13	13	3	Max	154	78	76	51.5		38.9	7.1									
immature																									
Mean	162	133	136	52.9	67.1	36.5	6.0	183	Mean	150	84	81	50.3	63.2	38.0	6.9									
SD	3.59	4.03	4.78	1.61	1.15	1.16	0.43	14.8	SD	4.06	4.76	4.80	1.27	0.39	3.42	0.11									
Min	154	123	126	50.0	65.8	34.5	5.4	160	Min	142	75	75	48.6	62.8	34.1	6.3									
Max	167	138	147	56.4	68.5	38.0	6.8	200	Max	157	89	89	52.1	63.6	42.2	7.4									
n	17	17	17	17	4	16	15	5	n	9	9	8	9	4	5	8									
Females: adult																									
Mean	152	128	129	47.5	65.2	35.0	6.1	172	<i>P. c. chalcothorax</i>																
SD	4.16	3.17	3.03	2.35	1.24	1.66	0.49	12.86	Mean	159	77	76	51.7	61.1	33.6	7.3									
Min	141	121	122	44.4	62.9	30.3	5.4	140	SD	1.41	2.83	2.83	0.99												
Max	163	135	134	54.1	67.5	37.0	7.5	185	Min	158	75	74	51												
n	26	25	24	24	18	25	25	14	Max	160	79	78	52.4												
subadult																									
Mean	153	85	81	50.0	62.6	37.3	7.0		<i>P. c. carolae</i>																
SD	2.57	5.26	6.16	1.54	1.01	1.75	0.46		Mean	159	82	82	52.6	61.5	36.8	7.4									
Min	148	74	75	48.1	61.5	34.5	6.2		SD	0.71	0.71	0.71	0.57												
Max	157	90	95	52.6	63.5	40.1	7.9		Min	158	81	81	52.2												
n	12	12	9	11	3	12	12		Max	159	82	82	53.0												
Females: adult																									
Mean	143	91	91	45.4	61.6	36.7	7.3		<i>P. c. chrysenia</i>																
SD	3.41	2.93	2.81	1.07	1.63	1.72	0.29		Mean	159	82	82	52.6	61.5	36.8	7.4									
Min	133	87	87	43.4	59.1	33.7	6.9		SD	0.71	0.71	0.71	0.57												
Max	146	96	95	47.1	63.4	39.1	7.9		Min	158	81	81	52.2												
n	13	13	11	13	7	12	12		Max	159	82	82	53.0												
subadult																									
Mean	153	85	81	50.0	62.6	37.3	7.0		<i>P. c. berlepschi</i>																
SD	2.57	5.26	6.16	1.54	1.01	1.75	0.46		Mean	153	99	99	49.5	63.2	33.9	7.6	210								
Min	148	74	75	48.1	61.5	34.5	6.2		SD	2.12	1.41	0.71	2.05		1.34	0.14									
Max	157	90	95	52.6	63.5	40.1	7.9		Min	151	98	98	48		32.9	7.5									
n	12	12	9	11	3	12	12		Max	154	100	99	50.9		34.8	7.7									
immature																									
Mean	156	77	75	47.3	57.9	34.2	6.8		Mean	153	99	99	49.5	63.2	33.9	7.6									
SD	0.00	0.00	0.14			2.26	0.64		SD	2.12	1.41	0.71	2.05		1.34	0.14									
Min	156	77	75	47.2		32.6	6.3		Min	151	98	98	48		32.9	7.5									
Max	156	77	75	47.4		35.8	7.2		Max	154	100	99	50.9		34.8	7.7									
n	2	2	2	2	1	2	2		n	2	2	2	2	1	2	2									

TABLE 30. Measurements (mm) and weights (g) of specimens of *Parotia carolae*

	Wing length	Tail length	Tail central length	Tarsus length	Total length	Bill head length	Bill width	Weight	subadult	Mean	152	92	85	49.25	61.1	33.0	6.8
Males: adult																	
Mean	154	75	76	50.1	61.5	34.9	7.2		Mean	159	82	82	52.6	61.5	36.8	7.4	
SD	1.36	2.52	1.56	1.25	0.72	2.23	0.36		SD	1.41	2.83	2.83	0.99				
Min	152	73	73	48.3	60.9	30.5	6.7		Min	158	75	74	51				
Max	166	82	78	52.6	62.2	37.6	8.1		Max	160	79	78	52.4				
n	12	12	12	12	4	10	12		n	2	2	2	2	1	1	1	
subadult																	
Mean	153	85	81	50.0	62.6	37.3	7.0		Mean	157	94	92	49.9	60.1	34.5	7.4	
SD	2.57	5.26	6.16	1.54	1.01	1.75	0.46		SD	2.08	5.69	1.53	1.01	1.10	1.62	0.45	
Min	148	74	75	48.1	61.5	34.5	6.2		Min	153	88	91	49.0	58.8	32.6	7.0	
Max	157	90	95	52.6	63.5	40.1	7.9		Max	157	99	94	51.0	60.8	35.5	7.9	
n	12	12	9	11	3	12	12		n	3	3	3	3	3	3	3	
Females: adult																	
Mean	143	91	91	45.4	61.6	36.7	7.3		Mean	159	82	82	52.6	61.5	36.8	7.4	
SD	3.41	2.93	2.81	1.07	1.63	1.72	0.29		SD	0.71	0.71	0.71	0.57				
Min	133	87	87	43.4	59.1	33.7	6.9		Min	158	81	81	52.2				
Max	146	96	95	47.1	63.4	39.1	7.9		Max	159	82	82	53.0				
n	13	13	11	13	7	12	12		n	2	2	2	2	1	2	2	
subadult																	
Mean	153	85	81	50.0	62.6	37.3	7.0		Mean	155	94	92	49.9	60.1	34.5	7.4	
SD	2.57	5.26	6.16	1.54	1.01	1.75	0.46		SD	2.08	5.69	1.53	1.01	1.10	1.62	0.45	
Min	148	74	75	48.1	61.5	34.5	6.2		Min	153	88	91	49.0	58.8	32.6	7.0	
Max	157	90	95	52.6	63.5</td												

Females: adult									
Mean	147	95	95	47.0	61.6	34.2	8.2	130	
SD	4.66	1.73	2.65	0.90	0.98	2.58	0.35	21.13	
Min	138	91	90	45.1	60.1	29.4	7.6	110	
Max	154	97	99	48.2	62.8	37.0	8.6	152	
n	9	9	9	9	7	6	9	3	
Males: adult									
<i>P. c. clelandiae</i>									
Mean	157	80	80	50.3	62.5	31.9	7.4	205	
SD	4.50	3.14	2.66	1.68	0.83	0.72	0.53		
Min	149	77	77	48.6	61.6	30.6	6.7		
Max	161	86	83	52.9	63.6	32.7	8.1		
n	8	8	6	7	4	6	8	1	
subadult									
Mean	154	89	87	52		36.4	6.9	211	
SD	5.57	7.51	9.19	1.20		0.71	0.42		
Min	148	84	80	51.2		35.9	6.4		
Max	159	98	93	52.9		36.9	7.2		
n	3	3	2	2		2	3	1	
Immature									
Mean	152	98	98	51.8	63.6	37.0	7.2		
SD	0.58	4.04	4.04	1.98		0.17	0.10		
Min	151	94	94	49.7		36.8	7.1		
Max	152	102	102	53.6		37.1	7.3		
n	3	3	3	3	1	3	3		
Females: adult									
Mean	147	94	94	48.6	62.3	36.2	7.9	163	
SD	4.64	2.30	1.79	2.67	1.03	1.37	0.46		
Min	141	91	93	45.9	61.2	35.2	7.1		
Max	153	97	97	51.7	63.2	38.5	8.3		
n	5	5	5	5	3	5	5	1	
Males: adult									
all subspecies									
Mean	155	77	77	50.3	61.5	34.3	7.2	205	
SD	3.21	3.31	2.80	1.59	1.43	2.45	0.46		
Min	149	73	73	47.2	57.9	30.5	6.3		
Max	161	86	83	53.0	63.6	38.9	8.1		
n	30	30	28	29	11	22	29	1	
subadult									
Mean	153	87	83	50.3	61.8	36.5	7.0	211	
SD	3.67	6.46	6.25	1.37	1.48	2.51	0.46		
Min	142	74	75	48.1	58.8	32.5	6.2		
Max	159	99	95	52.9	63.6	42.2	7.9		
n	31	32	27	30	14	26	31	1	
immature									
Mean	151	96	98	50.1	63.4	35.7	7.3	210	
SD	2.43	4.93	2.92	2.39	0.28	1.86	0.26		
Min	147	87	94	46.6	63.2	32.9	7.0		
Max	154	102	102	53.6	63.6	37.1	7.7		
n	7	7	5	7	2	5	6	1	
Females: adult									
Mean	144	92	92	46.3	61.5	36.2	7.6	138	
SD	4.29	2.89	3.17	1.68	1.52	2.05	0.56	240	
Min	133	86	85	43	57.9	29.4	6.5	110	
Max	154	97	99	51.7	63.9	39.1	8.8	163	
n	44	44	40	43	26	34	43	4	

TABLE 31. Measurements (mm) and weights (g) of specimens of *Parotia loweii*

	Wing length	Tail length	Tail central length	Tarsus length	Total head length	Bill length	Bill width	Weight
<i>P. l. lawesii</i>								
Males: adult								
Mean	154	80	79	49.7	63.6	33.3	5.3	
SD	3.87	2.33	1.75	1.86	1.25	1.73	0.67	
Min	148	73	76	45.7	61.9	30.3	4.4	
Max	163	84	83	52.3	67.1	36.8	6.9	
n	26	25	16	23	20	24	19	
subadult								
Mean	154	89	88	50.2	63.0	33.2	5.3	
SD	2.86	6.61	6.22	1.56	0.49	1.18	0.52	
Min	149	80	76	47.3	62.0	31.0	4.7	
Max	159	100	97	52.3	63.7	35.6	6.9	
n	17	17	16	16	12	17	16	
immature								
Mean	152	98	98	49.4	62.9	33.0	5.5	
SD	3.65	3.32	3.88	2.38	1.80	1.07	0.51	
Min	144	91	92	44.5	60.5	31.4	4.6	
Max	157	103	104	52.8	66.0	35.2	6.6	
n	13	13	11	12	7	12	11	
Females: adult								
Mean	150	99	97	47.8	62.5	33.6	5.7	141
SD	5.52	3.04	3.36	3.30	0.97	1.64	0.35	
Min	141	94	92	43.9	61.3	30.9	5.2	
Max	159	102	101	52.8	64.3	36.3	6.2	
n	11	11	10	11	10	11	11	1
<i>P. l. helena</i>								
Males: adult								
Mean	154	80	80	49.4	64.5	34.0	5.6	170
SD	2.69	2.29	1.06	1.69	1.48	2.39	0.39	5.94
Min	148	76	78	45.7	61.9	28.9	5.1	162
Max	160	84	82	53.1	68.8	38.6	6.5	177.0
n	23	23	12	22	17	22	21	5
subadult								
Mean	156	91	79	49.7	65.5	34.7	5.4	180
SD	2.99	11.39	7.07	1.14	0.99	1.98	0.37	7.78
Min	152	75	74	48.5	63.6	31.8	4.9	174
Max	160	103	84	51.5	66.5	36.6	5.9	185
n	6	6	2	6	6	6	6	2
Immature								
Mean	150	98	100	49.5	63.9	33.5	5.4	167
SD	2.77	3.71	2.52	1.40	1.42	2.04	0.45	9.19
Min	147	92	97	46.9	61.4	29.8	4.8	160
Max	154	102.6	102	51.0	65.4	36.4	6.1	173
n	9	9	3	8	8	9	9	2
Females: adult								
Mean	148	99	98	46.7	65.1	35.3	6.1	149
SD	3.71	3.17	3.42	1.78	0.54	0.67	0.59	8.98
Min	143	95	95	44.9	64.2	33.9	5.2	135
Max	150	107	105	51.1	65.9	36.1	7.3	158
n	14	14	8	14	13	13	13	5
<i>P. l. fuscior</i>								
Males: adult								
Mean	157	80	80	49.1	62.8	33.1	4.7	167
SD	0.79	2.05	0.00	1.23	0.82	2.28	0.34	7.67
Min	155	76	80	47.6	62.1	28.9	4.2	153
Max	157	82	80	51.0	63.9	35.9	5.1	195
n	7	7	2	7	6	7	6	47
subadult								
Mean	157	84		49.7	63.9	32.9	4.8	
n	1	1		1	1	1	1	
immature								
Mean	153	96	95	51.2	62.1	33.1	5.6	164
SD	1	3	1	1	1	1	1	14

Females: adult									
Mean	147	98	94	44.0	61.8	31.2	5.1	143	
SD	4.77	2.80		2.24	1.01	1.99	0.41	8.39	
Min	141	92		40.3	60.6	26.0	4.6	122	
Max	157	102.4		48.9	62.8	33.7	6.2	169	
n	13	13	1	13	4	13	13	55	

P. L. exhibita									
Males: adult									
Mean	157	79	80	49.8	62.4	33.1	5.2	175	
SD	2.71	2.77	1.73	1.60	1.25	1.95	0.68		
Min	152	75	77	47.0	60.1	29.9	4.0		
Max	161	83	82	52.8	64.1	35.3	6.5		
n	12	12	8	12	8	12	11	1	
subadult									
Mean	157	92	90	51.1		32.1	5.6	179	
SD	2.83	1.41	1.41	0.64		0.42			
Min	155	91	89	50.6		31.8			
Max	159	93	91	51.5		32.4			
n	2	2	2	2		2	1	1	
immature									
Mean	153	100	100	51.5	62.4	32.6	5.3	173	
SD	2.30	3.34	2.77	1.22	2.02	2.89	0.43	6.38	
Min	150	94	97	50.2	59.5	27.0	4.8	168	
Max	157	104	104	53.5	65.3	35.1	5.9	180	
n	7	7	5	7	6	7	7	4	
Females: adult									
Mean	145	97	96	45.6	62.2	31.8	5.6	154	
SD	1.57	2.90	2.39	0.88	1.04	2.28	0.42	11.15	
Min	143	93	92	44.4	61.2	27.1	5.0	139	
Max	147	103	98	46.9	63.6	34.4	6.5	166	
n	10	10	5	10	4	10	10	4	

all subspecies									
Males: adult									
Mean	155	80	80	49.6	63.6	33.5	5.3	167	
SD	3.23	2.36	1.48	1.67	1.47	2.05	0.61	7.55	
Min	148	73	76	45.7	60.1	28.9	4.0	153	
Max	163	84	83	53.1	68.8	38.6	6.9	195	
n	68	67	38	64	51	65	57	53	
subadult									
Mean	155	90	87	50.1	63.9	33.4	5.3	179	
SD	2.86	7.50	6.43	1.40	1.33	1.51	0.47	5.51	
Min	149	75	74	47.3	62.0	31.0	4.7	174	
Max	160	103	97	52.3	66.5	36.6	6.9	185	
n	26	26	20	25	19	26	24	3	
immature									
Mean	152	99	99	50.0	63.1	33.0	5.4	166	
SD	3.27	3.37	3.49	2.01	1.74	1.88	0.45	8.45	
Min	144	91	92	44.5	59.5	27.0	4.6	151	
Max	157	104	104	53.5	66.0	36.4	6.6	180	
n	30	30	20	28	22	29	28	20	
Females: adult									
Mean	148	98	97	46.0	63.4	33.0	5.6	144	
SD	4.40	2.97	3.14	2.58	1.61	2.36	0.59	8.92	
Min	141	92	92	40.3	60.6	26.0	4.6	122	
Max	159	107	105	52.8	65.9	36.3	7.3	169	
n	48	48	24	48	31	47	47	65	

TABLE 32. Measurements (mm) and weights (g) of specimens of *Pterodophora alberti*

	Wing length	Tail length	Tarsus length	Total head length	Bill length	Bill width	Weight
Males: adult							
Mean	124	85	32.2	49.4	24.6	5.2	84
SD	2.46	3.43	1.39	1.02	0.97	0.37	3.78
Min	120	79	29.5	47.9	22.7	4.6	80
Max	129	97	35.1	51.3	26.5	6.1	89
n	26	26	25	11	25	25	5
subadult							
Mean	124	87	32.5	48.1	23.4	4.8	
n	1	1	1	1	1	1	
immature							
Mean	120	86	32.5	49.4	24.4	5.3	78
SD	3.74	3.53	1.06	0.91	1.16	0.32	5.06
Min	112	78	30.6	48.6	21.4	4.8	72
Max	125	91	34.4	50.9	25.7	5.9	84
n	12	12	10	5	12	11	4
Females: adult							
Mean	113	82	30.6	48.1	24.0	5.5	75
SD	1.95	2.59	1.09	1.12	0.97	0.33	4.93
Min	108	77	28.8	45.6	22.4	4.8	68
Max	117	87	32.8	49.6	26.2	6.1	83
n	25	25	25	13	25	24	8
<i>P. a. burgersi</i>							
Males: adult							
Mean	125	85	32.6	48.5	24.3	5.3	
SD	5.57	2.52	1.68		2.23	0.32	
Min	119	82	31.5		21.9	4.9	
Max	130	87	34.5		26.3	5.5	
n	3	3	3	1	3	3	
immature							
Mean	119	86	31.2	47.2	23.1	5.3	93
SD	5.56	3.42	1.89	1.06	0.32	0.54	
Min	113	81	29.5	46.2	22.8	4.9	
Max	124	89	33.4	48.3	23.4	6.1	
n	4	4	4	3	4	4	1
Females: adult							
Mean	114	83	29.8	47.9	24.8	5.4	73
SD	2.00	2.74	0.56	3.61	0.96	0.23	
Min	111	79	29.3	45.3	23.4	5.2	
Max	116	86	30.4	50.4	25.7	5.8	
n	5	5	5	2	5	5	1
<i>P. a. hallstromi</i>							
Males: adult							
Mean	127	88	32.1	50.5	24.3	5.0	90
SD	3.38	2.36	0.75	1.62	1.11	0.31	4.34
Min	122	82	30.6	47.1	21.6	4.4	83
Max	133	94	33.5	52.5	26.4	5.7	95
n	24	25	25	14	24	23	8
subadult							
Mean	122	89	32.1	50.2	24.4	4.9	92
SD	5.77	3.54	1.04	0.28	0.88	0.43	
Min	114	83	30.6	50.0	23.6	4.3	
Max	128	92	33.3	50.4	25.8	5.5	
n	5	5	5	2	5	5	1
immature							
Mean	123	90	32.1	48.4	24.1	5.1	80
SD	3.85	2.73	1.43	1.88	0.96	0.44	7.7
Min	116	86	28.4	45.2	22.0	4.6	71
Max	129	95	34.4	51.1	26.6	6.1	93
n	24	24	23	12	23	21	7

Females, adult								C. r. rex							
Mean	118	86	31.0	48.5	24.0	5.7	84	Mean	100	31	163	26.1	48.9	26.6	4.9
SD	4.88	3.41	7.33	1.67	0.94	0.42	7.51	SD	2.80	1.49	10.68	1.02	1.19	0.87	0.38
Min	109	80	28.1	45.8	23.1	4.7	75	Min	96	28	142	22.2	46.5	25.2	4.2
Max	128	91	34.0	51.3	25.8	6.4	88	Max	106	35	182	27.5	50.8	28.7	5.8
n	15	15	15	7	14	14	3	n	30	29	26	30	22	29	22
all subspecies								subadult							
Males: adult								Mean	103	47	78	26.3	49.2	26.4	5.1
Mean	126	86	32.2	50.0	24.4	5.1	87	SD	3.55	10.52	37.70	1.10	1.14	0.77	0.45
SD	5.36	3.26	11.3	1.47	1.10	0.35	50.1	Min	97	30	51	24.0	47.9	25.3	4.4
Min	119	79	29.5	47.1	21.6	4.4	80	Max	109	58.5	155	27.7	51.2	28.3	5.8
Max	133	97	36.1	62.5	26.5	6.1	95	n	15	15	10	15	9	14	7
n	53	54	54	26	52	51	13	immature							
subadult								Mean	102	54	58	26.9	48.4	26.5	5.2
Mean	123	89	32.2	49.5	24.3	4.9	92	SD	3.09	1.94	2.61	0.65	0.72	0.73	0.49
SD	5.20	3.26	0.95	1.23	0.89	0.39		Min	96	50	52	25.5	47.4	24.9	4.4
Min	114	83	30.6	48.1	23.4	4.3		Max	107	59	62	28.0	49.6	27.9	5.9
Max	128	92	33.3	50.4	25.8	5.5		n	21	20	15	20	17	19	4
n	6	6	6	3	6	6	1	Females: adult							
immature								Mean	100	56	57	26.0	49.5	27.0	5.4
Mean	122	88	32.1	48.4	24.1	5.2	81	SD	3.07	2.59	2.97	0.77	0.94	1.27	0.48
SD	4.23	3.59	1.40	1.68	1.03	0.42	7.44	Min	94	50	51	24.7	47.2	24.7	4.1
Min	112	78	28.4	45.2	21.4	4.6	71	Max	107	61	61	27.5	50.9	30.4	5.8
Max	129	95	34.4	51.1	26.6	6.1	93	n	28	28	23	28	23	28	10
Females								C. r. coccineifrons							
Mean	115	84	30.6	48.2	24.1	5.5	77	Males: adult							
SD	3.93	3.31	1.17	1.48	0.97	0.36	6.61	Mean	102	34	158	26.5	48.2	25.9	5.1
Min	108	77	28.1	45.3	22.4	4.7	68	SD	1.37	1.75	10.56	0.67	1.57	0.60	0.28
Max	128	91	34	51.3	26.2	6.4	88	Min	100	32	136	24.9	46.5	25.1	4.7
n	45	45	45	22	44	43	Max	105	37	170	27.5	50.2	27.3	5.9	
								n	14	14	12	14	4	13	7
								immature							
								Mean	104	58	61	26.1	47.2	24.9	5.0
								SD	1.63	1.73	1.41	0.69	1.56	0.25	
								Min	102	56	59	25.5	23.3	4.7	
								Max	106	60	62	27.1	26.4	5.3	
								n	4	4	4	4	1	3	1
Females: adult								C. r. regius							
								Males: adult							
								Mean	102	59	60	26.9		25.6	5.1
								SD	0.71	0.71	0.00		0.42	0.07	
								Min	101	58	60		25.3	5	
								Max	102	59	60		26.9	5.1	
								n	2	2	2	1	2	2	
								C. r. similis							
								Males: adult							
								Mean	98	31	150	26.0	47.6	24.8	4.9
								SD	2.19	1.46	6.07	1.03	1.50	1.20	0.32
								Min	93	28	136	24.0	44.9	22.6	4.1
								Max	102	34	160	28.0	50.4	27.6	5.6
								n	36	35	32	35	19	35	40
								subadult							
								Males: adult							
								Mean	99	49	94	26.6	48.1	25.2	5.1
								SD	1.53	7.40	40.17	0.75	0.86	0.97	3.54
								Min	96	32	54	24.9	46.7	23.5	4.7
								Max	102	55	154	27.7	49.8	27.2	5.4
								n	16	14	8	16	11	15	2
								immature							
								Mean	100	54	59	26.2	47.2	24.8	5.0
								SD	2.52	2.19	2.23	0.73	0.65	0.68	0.29
								Min	96	50	56	24.5	46.2	23.5	4.4
								Max	106	58	63	27.4	47.9	26.3	5.6
								n	21	21	19	21	10	20	13
								Females: adult							
								Mean	97	55	58	26.0	48.4	25.3	5.4
								SD	2.08	2.05	2.09	0.66	1.75	1.29	0.58
								Min	93	49.1	52.9	25.0	44.4	22.6	4.4
								Max	103	57.4	63	27.8	51.1	27.7	6.9
								n	23	23	21	23	19	23	5

C. r. cryptorhynchus								
Males: adult								
Mean	101	32	155	26.5	47.5	25.3	5.2	
SD	1.65	1.87	9.57	0.69	1.54	0.93	0.38	
Min	99	30	139	25.2	45.4	24.0	4.7	
Max	104	35	167	27.3	48.7	26.6	5.8	
n	10	10	7	10	4	8	9	
subadult								
Mean	102	44	106	26.4	48.0	24.7	5.3	
SD	0.71	13.44	63.64	0.64	0.14	0.14		
Min	101	34	61	25.9	24.6	5.2		
Max	102	53	151	26.8	34.8	5.4		
n	2	2	2	2	1	2	2	
Immature								
Mean	99	56	59	26.5	49.5	26.4	4.6	
n	1	1	1	1	1	1	1	
Females: adult								
Mean	99	56	57	25.8	48.6	25.9	5.6	
SD	1.75	1.34	3.78	0.36	2.35	1.10	0.23	
Min	97	54	52	25.3	46.6	25.0	5.3	
Max	102	57	61	26.2	51.2	27.3	5.9	
n	6	5	5	6	3	6	6	
C. r. gymnorhynchus								
Males: adult								
Mean	99	30	161	26.5	48.1	26.6	5.2	
SD	2.22	1.74	13.07	0.74	1.37	0.71	0.44	
Min	93	28	134	24.8	46.0	25.3	4.5	
Max	105	35	177	28.1	49.8	27.7	5.9	
n	25	24	18	24	8	24	21	
subadult								
Mean	100	46	143	26.1	48.8	26.9	5.3	
SD	0.71	2.83	26.87	0.00	1.77	1.27	0.49	
Min	99	44	124	26.1	47.5	26	4.9	
Max	100	48	162	26.1	50.0	27.8	5.6	
n	2	2	2	2	2	2	2	
Females: adult								
Mean	98	53	57	25.8	49.9	27.8	5.7	
SD	1.58	3.02	1.58	0.63	1.72	2.03	0.42	
Min	96	50	56	25.4	48.0	25.0	5.1	
Max	100	57.3	59	26.9	51.4	30.3	6.2	
n	5	5	5	5	3	5	5	
all subspecies								
Males: adult								
Mean	100	32	158	26.4	48.8	26.3	5.1	53
SD	3.34	2.21	10.49	0.96	1.68	1.53	0.41	4.33
Min	93	28	134	22.2	44.9	22.6	4.1	43
Max	110	38	182	28.8	54.0	31.2	6.1	65
n	141	138	121	138	81	135	128	79
subadult								
Mean	102	48	94	26.6	49.2	26.2	5.2	55
SD	3.69	9.54	39.59	0.88	1.49	1.48	0.37	5.02
Min	96	30	51	24.0	46.7	23.5	4.4	48
Max	110	68	162	27.9	52	30.8	6.1	63
n	42	40	29	42	30	40	39	9
Immature								
Mean	102	55	59	26.5	48.6	26.0	5.2	53
SD	3.29	3.16	2.70	0.86	1.39	1.27	0.44	3.79
Min	96	50	52	22.9	46.2	23.3	4.4	42.0
Max	110	64	64	28.0	51.1	28.3	6.1	60.0
n	57	57	50	57	39	53	56	18
Females: adult								
Mean	99	56	58	26.2	49.2	26.6	5.5	50
SD	2.96	2.36	2.64	0.77	1.43	1.57	0.47	5.98
Min	93	49.1	51	24.7	44.4	22.6	4.1	38
Max	107	62	63	28.1	51.4	30.4	6.9	58
n	79	78	70	78	62	79	78	16

TABLE 34. Measurements (mm) and weights (g) of specimens of *Cicinnurus magnificus*

	Wing length	Tail length	Tail central length	Tarsus length	Total head length	Bill length	Bill width	Weight
Males: adult								
<i>C. m. magnificus</i>								
Mean	116	39	269	31.9	54.675	28.9	7.0	97
SD	2.61	2.05	23.03	1.09	1.03	1.12	0.44	6.82
Min	111	35	213	28.9	53.2	26.2	6.2	85
Max	121	43	319	33.9	56.5	31.3	7.9	110
n	26	25	21	25	12	25	25	13
subadult								
Mean	115	55	157	30.8	56.1	29.2	7.4	
SD	2.28	7.23	109.47	0.59		0.90	0.34	
Min	112	42	61	29.9		27.9	6.8	
Max	117	59	256	31.5		29.9	7.6	
n	5	5	4	5	1	4	5	
immature								
Mean	117	60	64	31.4	55.2	29.3	7.0	88
SD	3.74	1.22	2.66	1.42	1.48	0.85	0.48	8.84
Min	114	58	60	29.6	54.1	28.5	6.4	82
Max	124	61	67	33.5	56.2	29.9	7.6	94
n	6	6	6	6	2	6	6	2
Females: adult								
Mean	113	61	63	30.4	54.2	29.3	7.0	79
SD	2.76	2.79	4.11	1.49	0.95	1.28	0.39	6.26
Min	108	56	57	27.6	53.2	27.5	6.0	73
Max	117	66	69	33.4	55.8	32.7	7.7	89
n	16	16	14	16	8	16	16	7
<i>C. m. chrysopeltatus</i>								
Males: adult								
Mean	116	39	294	31.4	55.7	29.7	7.0	102
SD	1.88	2.17	19.64	1.06	1.24	1.05	0.25	6.30
Min	112	33	256	28.6	53.6	27	6.6	92.0
Max	120	42	321	33.0	57.1	31.9	7.6	119.0
n	24	22	19	23	7	22	23	36
immature								
Mean	116	61	64	31	56	30	7	98
SD	2.47	3.27	3.54	0.65	0.69	0.83	0.38	6.67
Min	111	56	57	30.0	54.6	28.5	6.2	74.0
Max	120	69	72	32.2	56.4	32.2	7.9	108.0
n	19	19	19	19	7	19	19	24
Females: adult								
Mean	112	60	62	30.2	55.4	29.4	7.1	91
SD	4.24	1.96	4.28	1.13	1.12	1.06	0.33	7.93
Min	107	57	56	27.9	53.9	26.4	6.4	81.0
Max	125	63	69	32.9	57.3	31.3	7.6	113.0
n	20	20	16	20	8	20	20	23
<i>C. m. hunsteini</i>								
Males: adult								
Mean	113	39	272	31.2	56.3	30.7	6.6	90.9
SD	2.42	1.83	19.88	1.04	0.88	0.70	0.35	8.21
Min	105	35	225	28.8	54.8	28.9	5.9	74.5
Max	117	43	303	33.1	58.4	32.7	7.3	105
n	38	38	32	35	24	37	38	33
subadult								
Mean	112	54	61	31.7	56.6	30.2	6.9	91
SD	5.15	4.09	1.94	1.99	1.36	1.70	0.55	
Min	104	47	58	28.3	55.1	26.9	6.0	
Max	120	58	64	35.1	58.2	31.8	7.8	
n	8	8	6	8	5	8	8	1
immature								
Mean	112	59	63	31.9	55.8	30.2	6.6	87
SD	2.99	2.73	2.98	0.87	0.86	0.66	1.14	8.40
Min	105	54	57	30.1	53.8	28.8	5.5	72
Max	117	67.5	71	33.7	57.1	31.7	7.7	108
n	33	33	32	33	16	33	33	27

Females: adult

Mean	108	59	60	30.0	55.4	30.4	6.9	77
SD	2.09	2.35	3.15	1.05	0.89	0.77	0.33	8.79
Min	104	53.9	53.3	26.5	53.9	28.6	6.3	62
Max	115	64	66	32.0	57.1	31.8	7.8	94
n	45	44	31	45	22	45	44	37

C. m. *intermedius*

Males: adult

Mean	115	38	258	32.0	56.1	30.8	7.1
SD	1.71	2.58	17.02	0.85	1.41	1.60	0.30
Min	112	35	229	30.2	54.5	28.7	6.5
Max	118	44	287	33.1	57.7	34.5	7.7
n	16	16	10	16	4	15	14

subadult

Mean	119	55		31.5		30.4	7.2
SD	3.54	0.71		0.78		0.92	0.28
Min	116	54		30.9		29.7	7.0
Max	121	55		32.0		31.0	7.4
n	2	2		2		2	

immature

Mean	116	59	62	31.8	56.1	31.3	7.2
SD	2.40	2.05	2.06	0.89	1.30	0.68	0.38
Min	111	55	58.1	29.5	54.3	29.6	6.3
Max	120	63	66	33.1	58.1	32.1	7.8
n	18	18	17	18	8	18	17

Females: adult

Mean	109	59	59	29.7	55.1	30.7	7.2
SD	2.42	2.60	2.88	0.87	0.61	0.87	0.32
Min	104	54	53	27.6	54.0	29.1	6.6
Max	116	63	64	31.0	56.1	32.7	7.9
n	27	27	24	27	12	26	

all subspecies

Mean	115	39	275	31.5	55.8	30.0	6.9	97
SD	2.63	2.10	23.17	1.07	1.21	1.31	0.41	8.68
Min	105	33	213	28.6	53.2	26.2	5.9	74.5
Max	121	44	321	33.9	58.4	34.5	7.9	119
n	104	101	82	99	47	99	100	82

subadult

Mean	114	54	99.2	31.4	56.5	29.9	7.1	85
SD	4.50	4.86	80.31	1.51	1.23	1.42	0.50	8.49
Min	104	42	58	28.3	55.1	26.9	6.0	79
Max	121	59	256	35.1	58.2	31.8	7.8	91
n	15	15	10	15	6	14	15	2

immature

Mean	114	60	63	31.7	55.8	30.2	6.8	92
SD	3.28	2.69	2.97	0.91	0.96	0.95	0.83	9.15
Min	105	54	57	29.5	53.8	28.5	6.5	72.0
Max	124	69	72	33.7	58.1	32.2	7.9	108.0
n	76	76	74	76	33	76	75	55

Females: adult

Mean	110	59	60	30.0	55.1	30.1	7.1	82
SD	3.26	2.52	3.70	1.11	0.96	1.09	0.35	10.48
Min	104	53.9	53	26.5	53.2	26.4	6.0	62.0
Max	125	66	69	33.4	57.3	32.7	7.9	113.0
n	108	107	85	108	50	107	106	67

TABLE 35. Measurements (mm) and weights (g) of specimens of *Cicinnurus respublica*

	Wing length	Tail length	Tail central length	Tarsus length	Total length	Bill head length	Bill length	Weight
Males: adult								
Mean	98	39	140	27.1	49.0	25.4	4.1	61
SD	1.49	1.40	6.41	0.55	0.62	1.00	0.32	5.36
Min	94	35	121	25.9	48.0	23.3	3.4	53
Max	101	41	150	28	50.2	27.7	5.0	67
n	28	28	22	27	13	27	27	6
subadult								
Mean	100	48	81	27.4	50.6	26.5	4.3	59
SD	1.33	4.75	38.22	1.18	2.97	1.27	0.34	
Min	98	41	53	24.6	48.5	25.0	3.7	
Max	102	53	146	28.5	52.7	28.7	4.6	
n	9	9	8	8	2	8	7	1
immature								
Mean	101	52	52	27.8	49.8	26.1	4.5	63
SD	1.34	2.55	1.52	1.06	0.66	0.80	0.07	2.08
Min	99	50	51	26.9	49.0	25.1	4.4	61
Max	102	56	54	29.0	50.6	27.2	4.6	65
n	5	5	5	5	4	5	5	3
Females: adult								
Mean	97	53	52	26.5	49.7	25.5	4.8	56
SD	2.50	2.29	2.24	1.05	1.18	1.42	0.21	3.27
Min	93	49	49	24.7	47.4	22.5	4.5	52
Max	101	58	59	28.7	51.6	27.6	5.1	60
n	16	16	16	15	9	14	13	6

TABLE 36. Measurements (mm) and weights (g) of specimens of *Paradisaea raggiana*

	Wing length	Tail length	Tail central length	Tarsus length	Total head length	Bill length	Bill width	Weight	
<i>P. r. raggiana</i>									
Males: adult									
Mean	189	136	447	42.1	69.8	39.6	10.1	272	
SD	3.53	4.64	45.31	2.25	0.93	1.11	0.61	16.47	
Min	185	128	358	38.6	68.4	37.9	9.3	238	
Max	197	144	493	45.6	70.9	41.4	11.1	285	
n	9	9	9	8	7	9	9	7	
subadult									
Mean	190	139	291	42.2	69.00	38.70	10.23	272	
SD	3.61	6.11	205.48	2.38	1.13	1.05	0.21	12.02	
Min	186	132	146	39.5	68.2	37.7	10.0	263	
Max	193	144	437	43.8	69.8	39.8	10.4	280	
n	3	3	2	3	2	3	3	2	
Immature									
Mean	186	132	126	43.6	69.7	40.4	9.6	233	
SD	3.54	4.95	1.41	0.71	0.78	1.20	0.85	10.6	
Min	183	128	125	43.1	69.1	39.5	9.0	225	
Max	188	156	127	44.1	70.2	41.2	10.2	240	
n	2	2	2	2	2	2	2	2	
Females: adult									
Mean	164	121	114	38.3	66.9	36.5	9.3	184	
SD	5.94	4.39	7.87	1.57	1.03	1.38	0.68	17.82	
Min	157	115	103	36.7	65.7	35.2	8.6	170	
Max	172	125	125	40.6	68.2	38.3	10.2	215	
n	5	5	5	5	4	4	5	5	
<i>P. r. augustaelecta</i>									
Males: adult									
Mean	184	131	451	41.9	66.4	37.5	11.2	276	
SD	5.35	3.14	30.12	1.47	1.77	1.13	0.74	24.07	
Min	160	124	373	39.4	62.2	35.4	11.0	234	
Max	194	136	523	45.5	70.3	39.8	13.0	300	
n	37	37	36	37	31	36	37	16	
subadult									
Mean	186	131	157	42.6	66.7	37.9	11.4		
SD	3.90	3.57	43.14	1.30	1.36	0.85	0.77		
Min	170	127	119	40.8	64.6	37.0	10.3		
Max	192	139	227	44.6	68.1	39.6	12.8		
n	9	9	9	9	6	9	9		
Immature									
Mean	177	129	119	42.4	66.2	37.6	10.8	223	
SD	7.11	6.36	7.66	1.41	1.65	1.12	0.58	40.99	
Min	163	120	106	39.3	63.5	36.7	9.7	199	
Max	191	146	137	45	68.4	39.8	11.4	270	
n	15	15	15	15	16	15	15	3	
Females: adult									
Mean	161	117	108	38.1	64.2	36.2	10.1	159	
SD	8.06	4.91	5.24	2.53	1.35	0.88	0.49	21.27	
Min	150	108	100	33.9	62.6	34.8	9.2	133	
Max	180	126	120	44	67.8	37.8	10.9	195	
n	27	27	26	26	16	27	27	10	
<i>P. r. intermedia</i>									
Males: adult									
Mean	185	132	448	42.4	68.2	39.1	10.5	257	
SD	4.02	3.85	34.43	2.00	2.63	1.13	0.60	20.82	
Min	178	127	384	39	64.5	35.4	9.0	234	
Max	191	141	505	45.7	71.2	40.6	11.5	274	
n	18	18	15	18	7	15	16	3	
subadult									
Mean	186	131	325	41.8	69.0	39.7	10.4		
SD	4.49	3.29	126.82	1.38	0.66	1.89	0.54		
Min	180	127	130	39.6	68.4	37.8	9.7		
Max	190	136	460	43.1	69.7	42.2	11.1		
n	5	5	5	5	3	5	5		
Immature									
Mean	175	128	121	43.0	64.4	38.6	10.2	225	
SD	4.03	3.77	5.48	1.22		1.38	1.17		
Min	172	124	117	41.4		37.0	9.3		
Max	181	133	129	44.1		39.6	11.5		
n	4	4	4	4		3	3		
Females: adult									
Mean	162	121	114	37.6	65.3	37.3	9.7	192	
SD	8.09	5.85	6.17	2.50	1.71	1.19	0.72	40.31	
Min	148	112	104	35.4	62.0	35.5	8.6	163	
Max	178	128	126	44.2	68.4	39.3	10.9	220	
n	13	13	13	12	10	13	13	2	
<i>P. r. salvadorensis</i>									
Males: adult									
Mean	188	135	463	43.0	69.9	38.9	9.8	266	
SD	4.47	5.53	31.06	1.35	1.31	1.17	0.48	15.25	
Min	180	125	410	38.8	67.0	36.5	9.0	240	
Max	198	154	527	45.6	72.5	41.1	10.8	295	
n	41	42	38	42	23	42	42	21	
subadult									
Mean	186	133	284	43.5	69.0	38.8	9.8	249	
SD	5.30	5.89	166.12	1.52	0.98	1.09	0.53	26.24	
Min	178	122	115	40.3	67.6	36.7	8.8	210	
Max	197	143	517	46.3	71.0	40.5	10.7	288	
n	20	20	17	19	13	20	18	9	
Immature									
Mean	177	127	120	42.7	69.1	38.7	9.7	225	
SD	7.51	6.07	7.19	1.99	1.81	1.40	0.69	23.54	
Min	160	115	106	35.4	66.3	36.4	8.6	189	
Max	190	136	131	45.1	71.6	42.1	11.2	255	
n	23	23	22	22	11	23	23	8	
Females: adult									
Mean	164	120	111	37.5	66.3	37.4	9.6	175	
SD	6.42	5.15	6.66	1.39	1.48	1.04	0.46	17.59	
Min	150	110	100	34.1	63.9	34.9	8.7	135	
Max	182	132	128	40.3	69.8	40.4	10.4	210	
n	31	31	29	30	20	31	31	24	
all subspecies									
Males: adult									
Mean	186	133	455	42.4	68.1	38.5	10.4	270	
SD	4.90	4.83	32.85	1.65	2.30	1.36	0.88	19.38	
Min	160	124	358	38.6	62.2	35.4	9.0	234	
Max	198	154	527	45.7	72.5	41.4	13.0	300	
n	105	105	98	105	68	102	104	47	
subadult									
Mean	186	133	256	42.9	68.4	38.7	10.3	253.5	
SD	4.72	5.31	146.88	1.60	1.45	1.25	0.88	26.40	
Min	178	122	115	39.5	64.6	36.7	8.8	210	
Max	197	144	517	46.3	71.0	42.2	12.8	288	
n	37	37	35	36	24	37	35	11	
Immature									
Mean	177	128	120	42.6	67.5	38.4	10.1	225	
SD	7.10	5.88	7.07	1.69	2.26	1.42	0.87	23.99	
Min	160	115	106	35.4	63.5	36.1	8.6	189	
Max	191	146	137	45.1	71.6	42.1	11.5	270	
n	44	44	43	43	29	43	40	14	
Females: adult									
Mean	162	119	111	37.8	65.5	36.9	9.8	173	
SD	7.26	5.27	6.44	2.05	1.73	1.17	0.58	20.79	
Min	148	108	100	33.9	62.0	34.8	8.6	133	
Max	182	132	128	44.2	69.8	40.4	10.9	220	
n	76	76	73	73	49	75	76	41	

TABLE 37. Measurements (mm) and weights (g) of specimens of *Paradisaea apoda*

	Wing length	Tail length	Tail central length	Tarsus length	Total head length	Bill length	Bill width	Weight
<i>P. a. apoda</i>								
Males: adult								
Mean	232	165	637	52.6	77.3	43.9	9.6	
SD	4.61	5.11	104.72	2.42	3.05	2.77	0.55	
Min	225	156	500	45.0	71.5	37.7	8.1	
Max	240	175	854	54.8	80	47.6	10.4	
n	16	16	14	17	6	16	17	
subadult								
Mean	228	161	361	52.3	76.0	44.4	9.65	
SD	5.25	5.33	205.60	1.44	1.55	1.58	0.27	
Min	219	152	150	49.6	74.7	42.6	9.2	
Max	239	170	659	54.6	77.9	48.0	10.2	
n	12	12	11	12	4	12	12	
immature								
Mean	209	151	146	51.2	75.9	44.0	9.6	
SD	9.07	5.68	8.61	2.71	3.98	2.23	0.49	
Min	198	141	132	45.0	72.5	41.4	8.9	
Max	224	161	160	53.4	80.3	48	10.3	
n	8	8	8	8	3	8	8	
Females: adult								
Mean	202	152	144	48.6	73.7	42.6	9.5	
SD	6.73	5.76	7.23	3.77	2.36	1.84	0.45	
Min	194	141	132	44.9	71.4	40.1	8.9	
Max	215	158	153	53.2	77.7	45.1	10.2	
n	8	8	8	8	7	8	8	
<i>P. a. novaeguineae</i>								
Males: adult								
Mean	206	146	591	46.7	72.5	40.4	9.4	
SD	3.05	3.95	57.60	1.20	1.27	1.25	0.32	
Min	200	140	480	44.6	70.0	37.6	9.0	
Max	213	154	663	48.9	74.7	42.6	10.1	
n	24	22	17	24	9	22	23	
subadult								
Mean	203	143	356	46.17	70.9	40.1	9.27	
SD	4.44	3.66	217.40	1.02	1.64	0.99	0.40	
Min	190	135	134	44.8	68.8	38.8	8.6	
Max	210	148	662	48.9	73.3	43.0	10.1	
n	27	26	19	26	7	24	26	
immature								
Mean	191	137	135	47.0	71.0	40.1	9.3	224
SD	7.95	3.90	6.77	1.21	2.27	0.95	0.35	212
Min	180	130	125	44.8	65.5	38.1	8.7	222
Max	209	143	146	49.3	74.0	41.6	10.1	225
n	25	24	21	25	14	22	25	2
Females: adult								
Mean	173	128	119	40.9	68.0	39.0	8.9	172
SD	6.29	6.76	6.84	1.88	1.04	1.09	0.36	212
Min	159	118	105	38.8	66.6	37.1	8.2	170
Max	188	142	132	45.8	70.5	40.7	9.6	173
n	26	26	25	26	15	25	25	2
all subspecies								
Males: adult								
Mean	217	154	612	49.1	74.4	41.9	9.5	
SD	13.39	10.44	84.10	3.43	3.20	2.65	0.43	
Min	200	140	480	44.6	70.0	37.6	8.1	
Max	240	175	854	54.8	80.0	47.6	10.4	
n	40	38	31	41	15	38	40	
subadult								
Mean	211	148	358	48.092	72.76	41.51	9.39	
SD	12.50	9.56	209.6	3.10	3.00	2.39	0.41	
Min	190	135	134	44.8	68.8	38.8	8.6	
Max	239	170	662	54.6	77.9	48.0	10.2	
n	39	38	30	38	11	36	38	

immature	196	140	138	48.0	71.9	41.2	9.3	224
Mean	11.19	7.71	8.56	2.46	3.15	2.23	0.41	2.12
SD	180	130	125	44.8	65.5	38.1	8.7	222
Min	224	161	160	53.4	80.3	48.0	10.3	225
n	33	32	29	33	17	30	33	2

TABLE 38. Measurements (mm) and weights (g) of specimens of *Paradisaea minor*

	Wing length	Tail length	Tail central length	Tarsus length	Total head length	Bill length	Bill width	Weight
<i>P. m. minor</i>								
Males: adult								
Mean	188	127	503	44.7	69.5	39.0	10.5	239
SD	4.71	4.43	48.76	1.65	2.19	1.70	0.45	23.72
Min	180	116	420	39.4	65.3	34.0	9.2	185
Max	196	133	641	47.8	72.5	42.5	11.4	285
n	27	27	23	27	19	27	27	12
subadult								
Mean	184	125	318	44.1	68.7	37.8	10.4	
SD	5.62	4.57	155.64	1.72	1.97	1.68	0.43	
Min	172	115	108	39.5	64.9	34.5	9.7	
Max	195	132	498	46.5	71.5	40.8	11.2	
n	21	20	16	19	14	21	21	
immature								
Mean	179	123	116	43.8	68.3	38.1	10.3	216
SD	8.00	6.27	7.57	2.20	1.96	1.57	0.65	19.91
Min	162	105	98	39.2	64.8	36.0	9.3	186
Max	194	130	127	46.9	72.7	41.4	12.1	242
n	22	22	18	21	21	22	22	7
Females: adult								
Mean	161	112	103	39.7	65.8	37.0	10.0	158
SD	6.18	6.06	6.50	2.30	1.70	1.42	0.68	10.84
Min	152	103	93	37.1	62.8	34.7	9.0	145
Max	174	126	118	45.2	69.0	40.0	11.7	170
n	23	22	19	23	21	23	22	6
<i>P. m. finschi</i>								
Males: adult								
Mean	190	131	469	44.4	70.0	38.3	10.4	256
SD	5.47	4.27	23.69	2.32	1.76	1.17	0.78	29.09
Min	180	124	430	39.2	66.8	35.7	8.5	183
Max	199	141	537	49.2	73.8	40.6	11.9	300
n	27	26	24	26	22	27	26	21
subadult								
Mean	190	130	357	44.6	68.8	38.2	10.5	230
SD	4.62	4.95	133.06	1.14	1.51	1.09	0.76	
Min	182	124	133	41.9	66.8	36.1	9.7	
Max	201	141	481	46	71.2	40.3	11.8	
n	15	15	14	15	13	15	15	1
immature								
Mean	179	124	121	43.9	67.8	37.3	9.8	205
SD	8.26	5.34	7.10	2.23	2.05	1.67	0.68	29.42
Min	165	110	108	40.6	62.8	32.2	8.7	151
Max	193	131	131	46.7	70.8	39.1	10.8	268
n	18	16	14	16	11	16	15	14
Females: adult								
Mean	164	115	109	41.4	66.9	37.4	10.2	164
SD	6.45	4.73	8.57	2.97	1.78	1.31	0.58	18.46
Min	152	104	97	36.5	64.3	34.5	9.0	141
Max	175	123	129	47.4	71.3	40.7	11.4	210
n	26	26	24	25	22	26	26	16

<i>P. m. jobiensis</i>								
Males: adult								
Mean	200	137	495	48.2	71.0	39.4	10.8	298
SD	7.55	3.78	62.64	1.15	2.09	1.31	0.52	4.04
Min	183	130	353	45.5	67.4	36.8	9.6	293
Max	210	144	566	49.4	73.6	41.4	11.5	300
n	12	12	9	11	7	10	12	3
subadult								
Mean	196	135	349	48.3	71.2	39.8	10.5	240
SD	5.75	6.60	146.88	2.09	2.00	1.48	1.00	
Min	184	122	162	43.9	68.5	37.5	9.2	
Max	203	143	482	50.1	73.7	42	12.5	
n	9	9	7	9	6	9	9	1
immature								
Mean	189	131	122	47.3	71.2	39.7	10.9	230
SD	12.19	4.53	6.40	1.97	1.26	0.77	0.71	20.28
Min	163	124	114	43.0	69.3	38.8	10.1	210
Max	200	138	130	49.0	72.8	40.7	12.2	250
n	8	8	8	8	7	8	8	2
Females: adult								
Mean	172	121	112	42.2		36.4	9.4	175
SD								20.31
Min								152
Max								189
n	1	1	1	1	1	1	1	3

<i>P. m. pulchra</i>								
Males: subadult								
Mean	190	130	435	45.1	66.8	38.3	10.8	
SD	4.65	4.03	29.74	1.95		0.99	0.28	
Min	164	124	403	43.7		36.9	10.5	
Max	194	133	462	47.3		39.0	11.1	
n	4	4	3	3	1	4	4	
immature								
Mean	187	128	121	44.9	71.7	40.5	10.3	
n	1	1	1	1	1	1	1	
Females: adult								
Mean	160	112	101	39.1	68.1	39.2	10.2	186
SD	2.45	0.96	4.32	0.29	0.35	0.60	0.52	
Min	157	111	95	35.9	67.8	38.6	9.4	
Max	162	113	105	39.6	68.3	40	10.5	
n	4	4	4	4	2	4	4	1

all subspecies								
Males: adult								
Mean	191	130	487	45.2	70.0	38.8	10.5	254
SD	6.91	5.49	44.93	2.32	2.00	1.47	0.62	30.13
Min	180	116	353	39.2	65.3	34.0	8.5	183
Max	210	144	641	49.4	73.8	42.5	11.9	300
n	66	65	56	64	48	64	65	36
subadult								
Mean	189	129	346	45.1	69.1	38.3	10.5	235
SD	6.70	6.02	139.79	2.28	2.01	1.56	0.66	7.07
Min	172	115	108	39.5	64.9	34.5	9.2	230
Max	203	143	498	50.1	73.7	42.0	12.5	240
n	50	48	40	46	34	49	49	2
immature								
Mean	181	125	119	44.4	68.7	38.1	10.2	210
SD	9.52	6.33	7.30	2.45	2.23	1.69	0.71	26.82
Min	162	105	98	39.2	62.8	32.2	8.7	151
Max	200	138	131	49.0	72.8	41.4	12.2	268
n	51	50	44	48	42	50	49	23
Females: adult								
Mean	163	114	106	40.4	66.3	37.2	10.1	165
SD	6.36	5.49	7.96	2.67	1.83	1.44	0.61	17.47
Min	152	103	93	36.5	62.8	34.5	9.0	141
Max	175	126	129	47.4	71.3	40.7	11.7	210
n	56	55	50	55	47	56	55	26

TABLE 39. Measurements (mm) and weights (g) of specimens of *Paradisaea decora*

	Wing length	Tail length	Tail central length	Tarsus length	Total head length	Bill length	Bill width	Weight
Males: adult								
Mean	181	137	431	41.1	67.6	36.7	8.9	237
SD	2.62	3.47	41.70	0.96	2.13	1.03	0.47	
Min	177	128	368	39.0	64.1	35.2	8.2	
Max	185	143	536	42.5	70.9	40.0	9.8	
n	22	22	16	21	7	20	20	1
subadult								
Mean	180	139	290	41.4	66.9	36.8	8.9	
SD	2.32	1.97	94.49	0.59	0.77	0.93	0.51	
Min	176	136	177	40.4	65.7	34.5	8.2	
Max	185	142	448	42.3	68.1	38.3	9.9	
n	17	17	16	16	7	17	16	
immature								
Mean	172	138	120	41.2	65.9	36.6	9.1	
SD	5.11	3.79	2.73	0.74		1.04	0.23	
Min	164	134	116	40.2		35.1	8.8	
Max	178	144	123	42.2		37.8	9.4	
n	7	7	6	7	1	6	7	
Females: adult								
Mean	160	128	109	37.2	64.5	35.9	8.9	
SD	2.56	2.82	2.27	0.79	0.40	1.31	0.48	
Min	157	123	104	36.4	64.1	34.4	7.9	
Max	165	131	112	38.5	64.9	38.7	9.6	
n	8	8	8	8	3	8	8	

TABLE 40. Measurements (mm) and weights (g) of specimens of *Paradisaea rubra*

	Wing length	Tail length	Tail central length	Tarsus length	Total head length	Bill length	Bill width	Weight
Males: adult								
Mean	176	119	563	41.9	63.9	35.5	8.6	201
SD	3.72	2.72	60.89	1.41	1.28	1.86	0.68	25.62
Min	169	114	478	37.8	60.8	30.9	7.0	158
Max	186	125	765	43.7	65.7	39.2	9.7	224
n	27	27	23	26	18	26	27	7
subadult								
Mean	174	121	243	41.7	63.1	34.0	8.2	201
SD	3.07	3.00	107.47	0.79	1.15	1.00	0.38	
Min	168	115	112	40.5	61.2	32.0	7.5	
Max	178	125	457	43.4	64.5	36.2	9.0	
n	17	17	16	17	7	17	16	1
immature								
Mean	170	119	117	42.3	63.4	35.2	8.6	195
SD	4.43	4.19	5.22	1.29	1.56	1.52	0.49	
Min	162	112	109	40.3	61.0	33.3	7.6	156
Max	178	126	127	44.7	65.8	38.4	9.2	212
n	10	10	9	10	7	10	10	8
Females: adult								
Mean	159	114	108	38.8	63.1	34.6	8.5	158
SD	6.26	4.19	3.88	1.84	1.61	1.28	0.62	26.83
Min	151	105	102	36.2	60.2	32.8	7.1	115
Max	174	121	117	43.5	66.4	38.5	9.8	208
n	26	26	24	25	19	26	26	10

TABLE 41. Measurements (mm) and weights (g) of specimens of *Paradisaea guilhelmi*

	Wing length	Tail length	Tail central length	Tarsus length	Total head length	Bill length	Bill width	Weight
Males: adult								
Mean	177	114	557	44.5	72.5	40.9	8.9	256
SD	3.69	3.56	75.41	1.16	1.58	1.65	0.43	6.74
Min	172	107	455	42.4	70.0	36.6	8.1	250
Max	188	121	693	45.9	76.0	43.3	9.7	265
n	27	27	17	27	18	27	6	
subadult								
Mean	177	116	168	44.3	73.5	41.8	9.3	250
SD	2.78	2.85	93.20	0.80	1.31	1.17	0.63	
Min	173	112	111	43.0	72.6	40.4	8.6	
Max	182	121	427	45.5	76	43.5	10.7	
n	10	10	11	10	7	10	9	1
immature								
Mean	172	117	114	44.1	74.2	43.3	9.6	219
SD	6.61	3.61	8.72	2.39	2.31	1.61	0.28	43.8
Min	163	113	104	40.6	72	42.3	9.3	188
Max	179	120	120	45.7	76.6	45.7	9.9	250
n	4	3	3	4	3	4	4	2
Females: adult								
Mean	158	106	104	40.3	70.3	39.9	9.0	
SD	5.82	3.87	5.24	1.68	1.60	1.09	0.52	
Min	151	101	95	38.5	68.2	37.6	8.0	
Max	171	117	113	44.5	73.2	42	10.0	
n	15	15	15	15	12	15	15	

	<i>P. r. amplexa</i>																	
	<i>P. r. marginatae</i>																	
Males: adult																		
Mean	154	82	409	38.1	68.4	39.7	8.2	178										
SD	3.27	3.21	12.06	1.70	0.88	0.68	0.39	5.56										
Min	151	78	398	36.1	67.5	39.0	7.6	174										
Max	159	86	422	40.1	69.7	40.4	8.5	189										
n	5	5	3	5	5	5	5	6										
immature																		
Mean	152	93	94	38.4	68.7	40.3	8.4	163										
SD	5.15	3.08	2.66	1.55	1.18	0.85	0.45	10.34										
Min	142	90	90	35.7	66.9	39.2	7.7	149										
Max	157	99	98	40.6	70	41.8	9.1	174										
n	7	7	6	7	6	7	7	4										
Female																		
Mean	147	91	94	36.3	65.3	38.0	8.2											
n	1	1	1	1	1	1	1											
	<i>all subspecies</i>																	
	<i>Males: adult</i>																	
Mean	157	82	414	39.4	70.1	41.2	8.6	176										
SD	3.06	3.95	25.67	1.65	1.62	1.56	0.56	7.99										
Min	151	76	341	36.1	67.5	39.0	7.6	158										
Max	163	91	458	41.8	73.8	45.6	9.6	189										
n	30	30	23	29	24	28	30	9										
	<i>subadult</i>																	
Mean	160	87	102	39	70.9	42.3	8.5											
SD	4.24	3.54	0.71	0.99	0.78	0.71	0.49											
Min	157	84	101	38.3	70.3	41.8	8.1											
Max	163	89	102	39.7	71.4	42.8	8.8											
n	2	2	2	2	2	2	2											
	<i>immature</i>																	
Mean	154	95	96	39.0	69.1	40.5	8.4	165										
SD	4.36	3.52	3.31	1.41	1.20	1.04	0.36	8.1										
Min	142	90	90	35.7	66.9	38.6	7.7	149										
Max	161	101	102	41.2	70.4	42.0	9.1	174										
n	16	16	15	15	10	16	16	7										
	<i>Females: adult</i>																	
Mean	149	93	94	38.0	68.7	40.5	8.7	153										
SD	5.39	4.52	3.64	1.63	1.80	1.29	0.43	19.75										
Min	142	86	88	35.5	65.3	38.0	8.0	124										
Max	159	102	101	41.0	72.0	42.9	9.7	166										
n	23	23	21	23	20	22	23	4										

TABLE 42. Measurements (mm) and weights (g) of specimens of *Paradisaea rudolphi*

	Wing length	Tail length	Tail central length	Tarsus length	Total head length	Bill length	Bill width	Weight							
	<i>P. r. rudolphi</i>														
Males: adult															
Mean	157	83	409	40.1	70.7	41.6	8.6	177							
SD	2.72	4.06	24.19	1.30	1.44	1.56	0.57	2.12							
Min	153	76	341	36.5	68.2	39.6	7.6	175							
Max	163	91	452	41.8	73.8	45.6	9.6	178							
n	20	20	17	19	16	19	20	2							
subadult															
Mean	160	87	102	39	70.9	42.3	8.45								
SD	4.24	3.54	0.71	0.99	0.71	0.49									
Min	157	84	101	38.3	70.3	41.8	8.1								
Max	163	89	102	39.7	71.4	42.8	8.8								
n	2	2	2	2	2	2	2								
immature															
Mean	155	93	96	40.0	70.1	41.3	8.4	165							
SD	3.30	3.76	4.50	1.14	0.00	0.41	0.19								
Min	150	90	91	38.8	70.1	40.9	8.3								
Max	157	97	102	41.2	70.1	41.8	8.7								
n	4	4	4	4	2	4	4	1							
Females: adult															
Mean	150	95	95	38.4	69.2	40.8	8.6	157							
SD	5.71	4.24	3.46	1.68	1.65	1.18	0.47								
Min	142	90	90	35.5	66.4	38.4	8.0								
Max	158	102	101	41.0	72.0	42.9	9.7								
n	15	15	14	15	13	14	15	1							